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OBSTETRICS

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OBSTETRICS

J. M. HOLMES
M.D., B.S. (LOND.), M.R.C.O.G.
Consultant Obstetric and Gynæcological Surgeon, University College Hospital, London; Examiner in Obstetrics and Gynæcology to the University of London; Late Resident Obstetrician, Queen Charlotte's Maternity Hospital, London.

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E. LIPMAN COHEN
M.A., M.B., B.CHIR.
Consultant in Dermatology to Oldchurch Hospital, Romford
and St. Margaret's Hospital, Epping

First Edition, February, 1964

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7 & 8 Henrietta Street
London, W.C.2

Printed in Great Britain

Preface

When the publishers approached me with the suggestion that I should write this small textbook on obstetrics they gave me a completely free hand subject only to some restriction as to the size of the book. I have therefore been able to include the many advances in medical treatment which have influenced the practice of obstetrics in recent years.

A concise textbook cannot be a complete textbook, but a dogmatic summary such as I have written will assist the student to marshal the facts that he has learnt during his clinical teaching. If he succeeds in obtaining a thorough grasp of the basic knowledge of his subject he will need only a minimum of supplementary reading to meet the requirements of the Final M.B.

I have included as an appendix a list of drugs commonly used in obstetrics and I hope that the student will find the book as a whole a helpful and useful guide to the study of obstetrics.

J. M. HOLMES

28 WEYMOUTH STREET,
LONDON, W.1.
November, 1963

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Section One

PREGNANCY

CHAPTER ONE

The Anatomy of the Pelvis

The bony pelvis can be considered as a girdle by which the weight of the trunk is transmitted to the lower extremities. It is made up of three bony masses: the sacrum and coccyx behind, and the two innominate or hip bones anterolaterally. Each of these masses is subdivided. The sacrum consists of five fused sacral vertebræ. The coccyx consists of three to five small fused vertebræ. Each hip bone is made up of the ilium, the ischium and the pubis. The pelvic inlet is bounded behind by the sacral promontory and on each side by the arcuate line. The false pelvis lies above this line and the true pelvis (the bony birth canal) below.

The True Pelvis. This is bounded posteriorly by the sacrum and coccyx, laterally by the ischia and the lower part of the ilia, and anteriorly by the pubis. The space between the sacrum and the ischium on either side is filled by the sacrosciatic ligament, the sacrotuberous ligament and the pyriformis muscle. Anterolaterally the obturator foramen is closed by the obturator membrane and the obturator internus muscle.

INTERNAL MEASUREMENTS OF THE TRUE PELVIS

	Antero-posterior	Oblique	Transverse
Brim .	4¼ in.	4¾ in.	5¼ in.
Cavity .	4¾ in.	—	4¾ in.
Outlet .	5¼ in.	4¾ in.	4¼ in.

Measurements of the Brim. The brim of the pelvis is roughly elliptical with the shorter diameter anteroposteriorly. This anteroposterior measurement or obstetric conjugate is taken from the sacral promontory to the posterior aspect of the top of the symphysis pubis and is normally $4\frac{1}{4}$ inches. The oblique measurements are taken from the sacro-iliac joint of one side to the opposite iliopectineal eminence. The right oblique is measured from the right sacro-iliac joint and the left oblique from the left sacro-iliac joint. These measurements are each $4\frac{3}{4}$ inches. The transverse diameter ($5\frac{1}{4}$ inches) is the maximum distance across the brim. The circumference of the brim is approximately 16 inches.

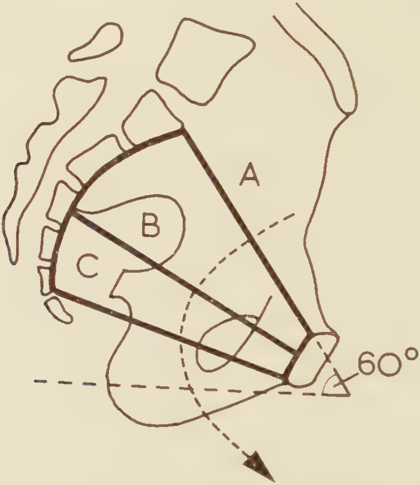


FIG. 1. Inner View of Pelvis.

A. Obstetric conjugate—$4\frac{1}{4}$ inches.
B. Antero-posterior diameter of cavity—$4\frac{3}{4}$ inches.
C. Antero-posterior diameter of outlet—$5\frac{1}{4}$ inches.
The axis of the birth canal is indicated by the curved dotted line.

Measurements of the Pelvic Cavity. This cavity is nearly circular and the two measurements described are both $4\frac{3}{4}$ inches. The anteroposterior diameter is measured from the middle of the posterior aspect of the symphysis to the lower margin of the front of the second sacral vertebra. The transverse measurement is taken between points on the inner aspect of the lateral pelvic walls at the same level as the anteroposterior diameter. The obstetrician is more often interested in a transverse diameter which lies slightly below this level between the tips of the ischial spines. This bispinous diameter is approximately 4 inches.

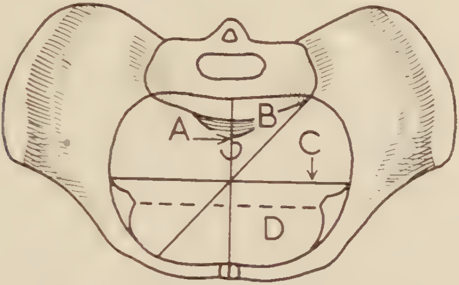


FIG. 2. The Pelvis, seen from above.

A. Obstetric conjugate—4¼ inches.
B. Left oblique conjugate—4¾ inches.
C. Transverse diameter of the brim—5¼ inches.
D. Bispinous diameter—4 inches.

Measurements of the Outlet. The anteroposterior diameter is measured from the lower margin of the symphysis to the lower border of the last piece of the sacrum. It is approximately 5 inches. The coccyx is normally deflected backwards during the passage of the fœtal head. The transverse diameter is taken between the posterior parts of the ischial tuberosities and measures 4¼ inches. The subpubic arch is Norman in shape.

Practical Considerations. It will be seen from the above that the anteroposterior diameters increase from above downwards while the transverse diameters tend to decrease slightly. This explains why in most cases the fœtal head enters the brim of the pelvis with the sagittal suture running transversely and as it descends through the pelvic cavity the head rotates to bring the occiput behind the symphysis pubis.

Except on rare occasions the brim of the pelvis is the level at which difficulty may arise. If the fœtal head passes through the brim of the pelvis, safe vaginal delivery is usually possible.

Clinical Pelvimetry

External Pelvic Measurements. In the past it has been taught that the measurement of the false pelvis will give an indication of the size of the true pelvis. This, however, is not true and such measurements may be misleading. External calipers should be discarded.

Internal Pelvic Measurements. Most obstetricians will delay the internal examination until the thirty-sixth week when the vagina is relatively spacious and the examination can be performed without causing discomfort. At this time too the size of the fœtal head can be compared with the pelvic brim and cavity. No one expects the young doctor to make a clinical assessment of the pelvis with any degree of accuracy until he has had many years of practice. He will, however, be able to divide pelves into three groups:

1. The pelvis which is large and adequate.
2. The pelvis which is grossly contracted.
3. An intermediate group of which he is not sure.

This third group may be submitted to X-ray pelvimetry, which provides an accurate assessment of the size of the bony pelvis.

When assessing the internal pelvic measurements we first try to ascertain the anteroposterior diameter of the pelvic brim or true conjugate. This may be gauged by subtracting half an inch from the diagonal conjugate. The diagonal conjugate is measured by two fingers introduced into the vagina. The middle finger tries to touch the sacral promontory while the radial border of the second metacarpal is in contact with the subpubic point.

The side walls of the birth canal are palpated. The degree to which the ischial spines project into the pelvic cavity is estimated. Two fingers are pressed against the greater sciatic notch, and the anterior surface of the sacrum is palpated throughout its length. From these observations a clinical impression can be obtained of the size of the pelvic cavity.

The coccyx is palpated between the internal fingers and a hand placed over the buttock. Its mobility is confirmed and the anteroposterior diameter of the outlet is then measured directly with the internal fingers. Finally, the fingers are withdrawn and the clenched fist is pressed firmly between the two ischial tuberosities and this will give an assessment of the subpubic arch and pelvic outlet.

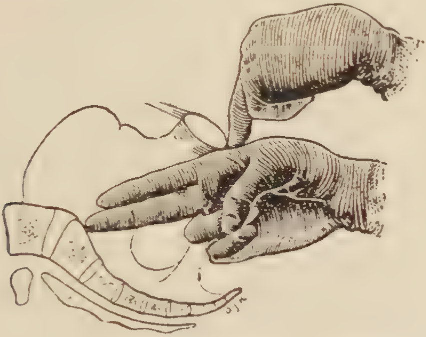


FIG. 3. Taking the Diagonal Conjugate.

During this examination the resistance of the pelvic floor muscles is also noted.

Pelvic Inclination. The plane of the pelvic brim makes an angle of about 60 degrees with the horizontal. A line passing horizontally back from the top of the symphysis will touch the tip of the coccyx. It will be seen that the bony pelvis thus consists of a curved canal with a long posterior wall (5 inches) and a short anterior wall ($1\frac{3}{4}$ inches).

The Axis of the Birth Canal. This is the curve which is taken by the centre of the fœtal head during its passage through the pelvis.

Pelvic Articulations. During pregnancy the ligaments and cartilages of the various pelvic joints become slightly more elastic and thus permit some degree of mobility. In this way the descent of the fœtal head through the brim during labour is facilitated by a small degree of backward movement of the upper part of the sacrum. Similarly, a certain degree of separation of the symphysis pubis allows an increase in the transverse diameters of the pelvis and the available antero-posterior diameter of the outlet. The coccyx is normally deflected backwards at the sacrococcygeal joint and offers no obstruction to the fœtal head.

Differences Between the Female and Male Pelvis. The female pelvis has the following characteristics:

1. It is lighter and less marked by muscle attachments.
2. The iliac crests are wider.
3. The acetabulum is smaller.
4. The pelvic brim is oval and more spacious in the forepart of the pelvis.
5. The inclination of the brim is greater.
6. The pelvic cavity is wider and shorter.
7. The sacrum is wider and bent sharply at the third sacral vertebra. The anterior surface of the sacrum is flatter above and below this joint.
8. The greater sciatic notch forms a wider angle (almost 90 degrees).
9. The obturator foramen is triangular.
10. The symphysis pubis is shorter from above downwards.
11. The body of the pubis is wider and the pubic crest is longer.
12. The subpubic arch is wide: 80-90 degrees as against 70 degrees in the male.
13. The ischial tuberosities are wider apart.

Contents of the Pelvis. The bony structure of the pelvis contains the internal reproductive organs, the rectum, the bladder, the pyriformis muscle, the obturator internus and the sacrococcygeal muscles, the sacral nerves emerging from the anterior sacral foramina, the branches of the iliac vessels, the ureter and the pelvic cellular tissue.

Such space as is available above these structures is occupied by the intestinal contents of the abdomen.

To prevent the descent of these structures the true pelvis is provided with a pelvic floor which, in the main, is formed by the levator ani muscle.

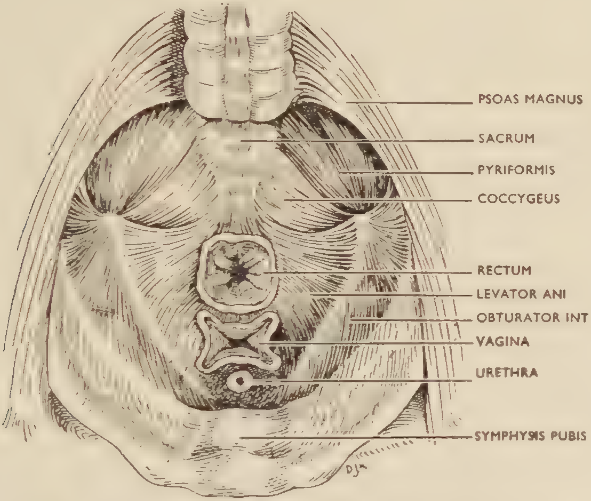


FIG. 4. The Muscles of the Pelvic Floor, seen from above.

The Pelvic Floor. This is formed by the peritoneum, the pelvic connective tissue, the pelvic fascia, the pyriformis, the coccygeus and levator ani muscles, the superficial perineal muscles and their covering fascia and the skin.

The Levator Ani Muscle. This has a linear origin from the ischial spine, from a linear thickening of the parietal pelvic fascia, and from the pubic bone; muscle fibres run medially to be inserted into the coccyx, the ano-coccygeal raphe, the deep external anal sphincter and the perineal body. It acts as a vaginal sphincter, it supports and lifts the perineum and anal canal.

The Coccygeus. This arises from the ischial spine and is inserted into the lateral border of the fifth piece of the sacrum and coccyx. It covers the pelvic surface of the sacrospinous ligament.

The Pyriformis. This arises from the anterior aspect of the second, third and fourth pieces of the sacrum and leaves the pelvis through the greater sciatic foramen.

CHAPTER TWO

The External Organs of Generation

The Mons Veneris

This is a rounded projection of fat lying in front of the pubes. The overlying skin is covered with pubic hair.

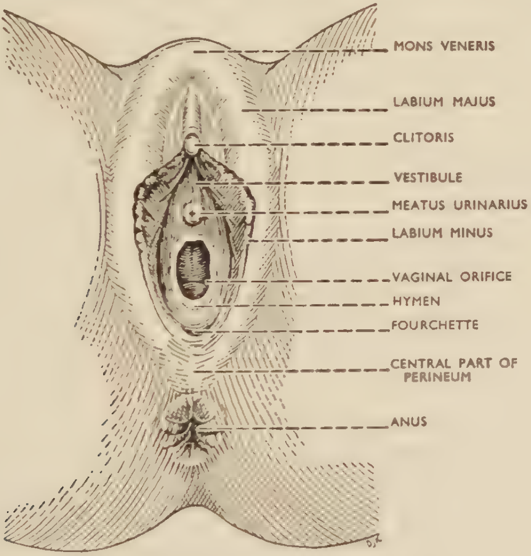


FIG. 5. The External Genital Organs.

The Labia Majora

These are two elongated folds which form the lateral boundaries of the pudendal cleft. They are united in front below the mons veneris to form the anterior commissure. A posterior commissure joins the posterior extremities in front of the anus. There are many hair follicles and sebaceous glands. The underlying elastic and fatty tissues support an erectile venous plexus. In the erect position the labia majora are in contact and conceal the other parts of the vulva.

The Labia Minora

These are two shorter folds of pigmented skin lying internally to the labia majora. The posterior extremities form a short transverse fold, the fourchette or frenulum labiorum. The anterior extremities split each into two layers, the upper of which meet above the clitoris and form its prepuce. The lower layers form the frenulum of the glans clitoris.

The Clitoris

This is a small, erectile, and highly sensitive organ at the anterior end of the vulva. It is homologous with the penis, and has a glans and two corpora cavernosa, but no urethra or corpus spongiosum.

The Vestibule

This is a triangular area which lies between the labia minora and in front of the fourchette with the apex at the clitoris. On it the urethral and vaginal orifices open. It is a vascular area which, if injured during labour, may give rise to considerable hæmorrhage.

The Urethra

This is 1½ inches long and runs downwards and forwards to open into the vestibule 1 inch below the clitoris. It is related to the lower third of the anterior vaginal wall and is lined throughout its length with transitional epithelium. Small para-urethral glands open into the urethral meatus.

The Greater Vestibular Glands (Bartholin's glands)

These are two compound racemose glands which are intimately related to the lateral walls of the vagina. The duct from each passes downwards in the vaginal wall and opens into the lower part of the vagina near the posterior part of the labium minus just outside the hymen. During sexual excitement a watery fluid is secreted which serves as a vaginal lubricant.

The Perineum

This is the area between the fourchette and the anus. It is 1½ inches long and is divided by a median raphe into two halves. Above is the perineal body, which is a pyramidal mass of tissue 1½ inches high, consisting of fibrous, fatty and muscular tissues. It is supported by the levator ani muscle, the anal sphincter, the ano-coccygeal raphe and the perineal membrane.

The Vaginal Orifice. The orifice occupies the posterior half of the vestibule. In the virgin it is partly closed by the hymen, which is a thin perforated membrane. The hymen is generally split during first coitus, the remnants being termed carunculæ myrtiformes. Rarely the vagina is sealed by the remnants of vaginal bulb tissue, which has failed to canalize. This causes a retention of menstrual fluid. The hymen lies superficial to this membrane and is stretched over its periphery.

CHAPTER THREE

The Internal Generative Organs

THE VAGINA

The vaginal canal passes upwards and slightly backwards from the pudendal cleft. The anterior wall is 3 inches long, but owing to the anteversion of the uterus the posterior wall is 3½ inches long. These walls are normally in contact. Anteriorly, the vagina is intimately related to the base of the bladder in the upper two-thirds and to the urethra in the lower third. Posteriorly, the upper third is related to the peritoneum of the recto-uterine pouch (Pouch of Douglas), the middle third to the rectum and the lower third to the perineal body. The levator ani muscle embraces the lateral walls and forms a sphincter 2 inches from the introitus. The summit or vault of the vagina is divided into anterior, posterior and lateral fornices.

The Structure of the Vagina

There is an outer coat of vascular connective tissue fused to the perineal membrane and levator ani fascia; a middle muscular coat of interwoven longitudinal and circular unstriped muscle fibres; an aveolar submucous fascia; and a squamous epithelium of about 15 cells thickness. The cervical mucous secretion keeps the vagina moist and prevents stratification.

The vaginal skin is thrown into transverse rugæ, which are most marked in the virgin. During pregnancy, the vagina increases in vascularity and undergoes hypertrophy, thus rendering it capable of great distension during childbirth.

THE UTERUS

The uterus is a hollow, muscular organ with walls $\frac{1}{2}$ inch thick. It is pyriform in shape and is 3 inches long, 2 inches wide and 1 inch thick. The lower inch of the uterus is narrow and barrel shaped and is termed the cervix. It projects into the upper vagina to which it is firmly attached. The upper portion of the uterus is termed the body and its convex upper extremity constitutes the fundus. The lumen of the cervical canal is spindle shaped and communicates

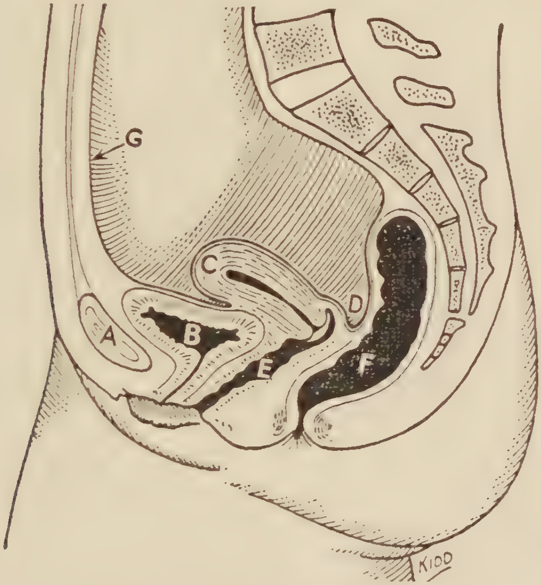


Fig. 6. The Female Pelvis (median section).

A. Symphysis pubis.
B. Bladder.
C. Uterus.
D. Pouch of Douglas.
E. Vagina.
F. Rectum.
G. Peritoneum.

below with the vagina through the external os uteri; it communicates above with the uterine cavity proper through the internal os uteri. The anterior and posterior walls of the uterine body are opposed, but are separated by a triangular cavity with the internal os uteri forming the inferior apex. The angles of the triangular cavity are formed by the two openings of the uterine tubes, which are attached to the upper part of the uterus.

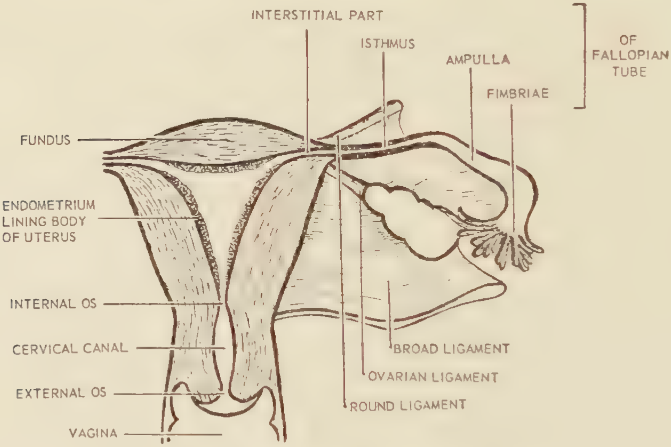


Fig. 7. The Reproductive Organs from Behind.

Normally the long axis of the uterus is bent forwards on the long axis of the vagina and this is termed anteversion. The uterine body is bent forwards on the cervix and this is termed anteflexion.

The Structure of the Uterus

The uterus has three coats: mucous, muscular and peritoneal. It is convenient to give separate descriptions of these coats in the body and in the cervix.

1. *The Uterine Body.* (*a*) *The Peritoneal Coat.* This is closely attached over the posterior surface, the fundus, and the

upper part of the anterior wall. The attachment is relatively loose over the lower part of the anterior wall, and at the level of the internal os the peritoneum is reflected on to the bladder, making the uterovesical pouch. At the sides, the uterus has a small area bare of peritoneum, where the layers of peritoneum on the front and back of the uterus come nearly into contact before leaving the uterus to form the broad ligament. (*b*) *The Muscular Coat.* This consists mainly of a middle layer of interlacing bundles of muscle fibres running in all directions. Externally to this there is a thin layer running longitudinally. Fibres from this are prolonged into the round ligaments and the uterine tubes. Internally there is the circular system. These circular fibres are best marked in three areas, two around the openings of the uterine tubes, and one in the region of the internal os. (*c*) *The Mucous Coat or Endometrium.* This is lined by columnar epithelium resting upon a cellular stroma. From the surface of this mucosa, tubular glands lined with columnar epithelium dip down through the stroma with their tips extending into the muscle layer. Under the influence of the ovarian hormones the endometrium undergoes characteristic changes during each menstrual cycle. Soon after menstruation the glands are small, narrow and straight; the epithelium is cuboid; the small round cells of the stroma are dense and compact; and the spiral vessels are short. Development progresses until just before the next menstrual period when the glands are very tortuous with a saw-tooth appearance; the epithelium is tall columnar with basal nuclei; the cells of the stroma are large with a wide cytoplasm; the stroma is more vascular and œdematous; and the spiral vessels are long and very coiled. The changes become even more marked in early pregnancy, and the stromal cells (decidual cells) assume a characteristic appearance with wide cytoplasm, round nucleus, polygonal outline and mosaic arrangement.

Menstruation is associated with rupture of the blood vessels, the formation of submucosal hæmorrhages, desquamation and necrosis of the superficial mucosa, and massive infiltration with leucocytes.

2. *The Cervix.* (*a*) *The Peritoneal Coat.* The peritoneum covers only the posterior part of the upper half of the cervix (supravaginal) from which it passes on to the posterior vaginal fornix and thence on to the rectum, thus forming the floor of the Pouch of Douglas. Anteriorly, the peritoneum has left the uterus at the level of the internal os, and laterally, at the same level, the two layers of the broad ligament have become separated by the mass of condensed pelvic cellular tissue which runs inwards to become attached to the cervix and lateral vaginal fornix. (*b*) *The Muscular Coat.* The cervix is composed mainly of fibrous tissue. A few longitudinal muscle fibres extend along the outer aspects of the cervix and are in continuity with the longitudinal muscle fibres of the uterine body. A small group of circular muscle fibres is situated around the internal os uteri. Abnormal spasm of these muscle fibres may result in delay of cervical dilatation during labour. (*c*) *The Mucous Coat.* The tall columnar epithelium is thrown into longitudinal and horizontal folds called the arbor vitæ. From this lining mucosa branching glands, lined by similar epithelium, dip into the cervical musculature. Blocking of the ducts of the glands leads to the formation of small retention cysts (Nabothian follicles) which sometimes bulge the surface of the portio vaginalis. The columnar epithelium of the cervical canal ends inferiorly at about the external os uteri. Here it becomes continuous with the squamous epithelium which covers the surface of the cervix exposed to the vaginal canal.

The Vessels of the Uterus. These are derived from ovarian and internal iliac arteries. The ovarian artery reaches the broad ligament through the infundibulopelvic fold, and runs along the free border of the broad ligament, generally about $\frac{1}{2}$ inch below the level of the tube. The uterine artery, a branch of the internal iliac, enters the base of the broad ligament and, after passing over the ureter, reaches the side of the uterus and continues up its lateral border. An anastomosis takes place between the ovarian and uterine arteries at the side of the uterus. From these main lateral stems, branches are given off at right angles which enter the muscular coat; through this they find their way, twisting tortuously among the muscular bundles, and finally form a capillary meshwork in the mucous membrane.

From this meshwork the blood is taken back by the small veins, which end in thin-walled sinuses lying in the middle muscular coat; from these sinuses the blood is carried off, chiefly by the uterine veins, which lie in the broad ligament, and by the ovarian veins.

The Lymphatics of the Uterus commence in vessels or spaces in the different coats. The efferent lymphatics are divided into two main groups.

The upper group drains the upper half of the uterine body. The majority of these accompany the ovarian veins along the upper part of the broad ligament, and thence via the infundibulopelvic folds to the retroperitoneal area of the posterior abdominal wall, where they end in glands on the lumbar aorta. A few lymphatic channels of this group run along the round ligament to end in the inguinal glands. Note, therefore, that the lymphatic drainage from much of the upper uterine body is in an upward direction.

The lower group drains the lower part of the body of the uterus, the cervix, and the upper part of the vagina. Most of these lymphatics run laterally and posterolaterally in the pelvic cellular tissue to end in glands situated on the side wall of the pelvis in the angle formed by the bifurcation of the common iliac artery into its external and internal branches. Some channels turn almost directly backwards to run in the cellular tissue between the uterosacral peritoneal fold, to reach the pararectal lymphatic glands.

The Development of the Uterus. The uterus is developed by fusion of the lower parts of the two paramesonephric (Müllerian) ducts, the upper parts of which persist as the uterine tubes. When the fusion of the lower parts of the ducts has been incomplete, uterine abnormalities result. These vary in degree from a small septum partially dividing the upper part of the uterine cavity (uterus subseptus) to the complete doubling of the uterine body, cervix and vagina (uterus pseudodidelphys). These uterine malformations may result in abortion, oblique lie of the fœtus, retained placenta, obstructed labour and ruptured uterus. Often, however, the pregnancy and labour prove normal and the condition may go unrecognized.

The Broad Ligament of the Uterus. This consists of two layers of peritoneum which are triangular in shape when put on the stretch. Medially, the two layers separate to enclose the uterus. Inferiorly and laterally, they separate to cover the floor and side walls of the pelvis. Above the two layers become continuous with each other, so forming a free anterior border. Enclosed within this free border is the uterine tube. The ovary is attached to the posterior layer by a short peritoneal fold, known as the mesovarian. Between the layers of the broad ligament are found the uterine tube, the round ligament, the ovarian ligament, the epi-oophoron, the uterine and ovarian vessels and nerves.

The Round Ligament of the Uterus. This is a fibro-muscular cord which passes from the superolateral angle of the uterine body beneath the anterior layer of the broad ligament to the deep inguinal ring. Thence it traverses the inguinal canal and terminates in the labia majora. It helps to antevert the uterus on the vagina.

The Ovarian Ligament. This is a fibro-muscular cord which connects the lower pole of the ovary to the superolateral angle of the uterus. Both the round and ovarian ligaments are derived from the gubernaculum which it is believed is responsible for the descent of the gonad from the lumbar region.

The Pelvic Cellular Tissue. This is the connective tissue filling the spaces between the pelvic viscera and lying between the peritoneum above and the levator ani below.

Although largely of a loose structure, it exhibits two main condensations, the transverse cervical ligament and uterosacral ligament, which serve as the main supports of the uterus.

The Transverse Cervical Ligament (Cardinal ligament). This fibro-muscular structure is fan-shaped. It is attached to the fascia covering the piriformis muscle and the lateral masses of the middle three pieces of the sacrum. The fibres descend and are inserted into the supravaginal cervix and the lateral fornix of the vagina.

The Uterosacral Ligaments. These are short fibro-muscular cords which pass from the posterior aspect of the supravaginal cervix backwards to the lateral masses of the third piece of the sacrum. They embrace the rectum and form the lateral boundaries of the Pouch of Douglas. With the round ligaments they help to maintain anteversion of the uterus.

THE UTERINE TUBE (Fallopian Tube)

This lies in the upper free border of the broad ligament and is 4 inches in length. The medial end opens into the superolateral angle of the uterine cavity; the lateral end communicates with the peritoneal cavity. The interstitial portion runs through the muscle wall of the uterus. The inner third of the extra-uterine portion has a narrow lumen and is called the isthmus. The outer two-thirds expand to a funnel shape and is called the ampulla. It is broken up into finger-like processes or fimbriæ, one of which is attached to the tubal pole of the ovary.

In structure each uterine tube consists of an external longitudinal and an inner circular layer of muscle fibres, which blend with the muscular coats of the uterus. This muscular tube is lined by a mucous membrane which is thrown into longitudinal folds. The epithelium is ciliated and the direction of the current is towards the uterus. Inflammation in the uterine tubes may lead to adhesion of some of the mucosal folds, and in this way part of the lumen of the tube may be converted into a cul-de-sac. Should a fertilized ovum enter one of these, its further progress towards the uterus becomes impossible and a tubal pregnancy results.

THE URETER

This enters the pelvis on either side in front of the sacro-iliac joint and the bifurcation of the common iliac artery, and behind the peritoneum. It runs downwards near the internal iliac trunk to the region of the tip of the ischial spine. Here it turns forwards and inwards to pass beneath the uterine vessels, and then running just laterally to the lateral vaginal fornices it enters the bladder.

THE OVARY

The female gonad is a flattened ovoid body, measuring about 1½ inches long by 1 inch wide. These measurements are subject to considerable variation. It is attached to the posterior layer of the broad ligament by the mesovarian. It lies in contact with the lateral pelvic wall in a small depression, the ovarian fossa, which is bounded behind by the ureter and in front by the lateral umbilical ligament. The floor of this fossa is covered by peritoneum and separates the ovary from the obturator nerve, artery and vein. The long axis of the ovary is nearly vertical. The upper pole is connected to the uterus by the ovarian ligament and the lower pole is connected to the uterine tube by the ovarian fimbria. During pregnancy the ovary is carried upwards into the abdomen and its position thereafter is open to variation.

The ovarian artery arises from the aorta, just below the origin of the renal artery, and runs downwards on the posterior abdominal wall. It turns medially over the pelvic brim and external iliac vessels to enter the infundibular pelvic ligament of the ovary. Terminal branches anastomose with the uterine and help to supply the uterus as well as the ovary.

Structure of the Ovary. The surface cubical germinal epithelium is continuous with the peritoneum and rests on a firm fibrous layer, the tunica albuginea. The stromal connective tissue consists mainly of spindle cells with little fibrous tissue. The cortex is wide and dense and contains many scattered Graafian follicles in different stages of development. The medulla is more vascular and less dense.

The Structure of the Graafian Follicle. The wall of the follicle has an inner layer, the theca interna, which is a vascular connective tissue susceptible to hormone influence, and an outer layer, theca externa, which is condensed ovarian stroma. Within this capsule is the ovum surrounded by the cubical follicular cells of the membrana granulosa. As the follicle matures fluid accumulates within the membrana granulosa to form the follicular cavity with the unfertilized ovum and surrounding granulosa cells still attached to its surface, the discus proligerus.

The Ovum. This is a vesicle about 1/180 inch in diameter. It is invested by a structureless hyaline covering, the zona pellucida. Within this lies the yolk, a yellow granular viscid fluid. In the yolk is found the germinal vesicle, a large clear refractive vesicle containing a small dark body, the germinal spot.

The Corpus Luteum. The Graafian follicle ruptures about fourteen to sixteen days after the commencement of the previous menstrual period. This rupture is largely due to tension from the increasing liquor folliculi. After rupture the follicle collapses and opening is plugged with fibrin. The lining granulosa cells enlarge and become pigmented with the yellow lipoid substance, lutein, thus forming the corpus luteum. Later, vessels from the theca interna penetrate the corpus luteum which may become filled with blood.

In the event of fertilization and development of the corresponding ovum the corpus luteum will continue to grow for about three months and provide hormones which help to maintain the pregnancy.

If fertilization does not occur the corpus luteum shrinks and undergoes fibrosis to form the corpus albicans and finally, leaving a stellate cicatrix, the corpus fibrosum.

CHAPTER FOUR

The Ovarian Cycle and Menstruation

Theories of Menstruation

The anterior lobe of the pituitary gland secretes two hormones, the follicle stimulating hormone (F.S.H.) and the luteinizing hormone (L.H.). The F.S.H. probably stimulates the ovary to ripen Graafian follicles, while the L.H. probably stimulates the formation of the corpus luteum from the collapsed follicles.

The granulosa cells of the mature follicle secrete the œstrogenic hormone, œdradiol. Similar œstrogenic substances, œstriol and œstrone, are found in the placenta and urine respectively.

The corpus luteum secretes progesterone which is in part broken down and secreted in the urine as pregnanediol.

Œstradiol causes endometrial hyperplasia, which commences a few days after menstruation has ceased. The full maturation of the endometrium is only possible under the superadded influence of progesterone. The sudden fall of both œstradiol and progesterone is probably responsible for the onset of menstruation. The administration of progesterone can delay the onset of menstruation.

Ovulation occurs about fourteen days before the onset of the next menstrual period and the average menstrual cycle is twenty-eight days.

Menstrual Discharge

This consists of fragments of the previously hypertrophied endometrium suspended in blood and mucus. The blood is from the engorged capillaries and blood sinuses of the endometrium which have been opened by the shedding of this tissue. It is believed usually to have coagulated in the uterine cavity, but this coagulation is followed by the liquefaction of the clot. This is why the blood in the menstrual flow does not normally coagulate externally. The mucus is the secretion from the endometrial glands which have become enlarged and tortuous during the premenstrual phase.

The amount lost at each menstrual period is about 3 to 4 ounces, but this varies in different individuals and under varying climatic conditions. Ovulation and menstruation are suppressed during pregnancy and lactation as a general rule, but this is not always the case. Ovulation may take place and the ova may become impregnated even if the "periods" are absent during lactation, or from other causes.

Ovarian Activity

Before the onset of the first menstruation the breasts enlarge, hair appears on the pubes, and the pelvis takes on the developed female characteristics. Menstruation begins soon after puberty at about 14 years and recurs periodically about every four weeks until it finally ceases at about 48 years. At the menopause the ovaries and uterus commence to undergo atrophic changes. At this period of a woman's life she is apt to suffer from various nervous disorders and other functional ailments.

CHAPTER FIVE

The Development of the Ovum

Impregnation, or fertilization of the ovum by the spermatozoon, probably takes place in the ampullary end of the uterine tube, the spermatozoa reaching this point from the vagina by their own vibratile movement. The fertilized ovum is moved on towards the uterus by ciliary movement, and having arrived at its destination, embeds itself in the thick premenstrual endometrium. This lining now becomes still thicker and more vascular, and so becomes converted into decidua. As in the case of the premenstrual endometrium the decidua is divided into a superficial compact layer and a deep spongy layer. In the compact layer the stroma cells become enlarged and, by mutual compression, polygonal in shape. Their nuclei are faintly staining. The spongy layer consists mainly of enlarged, tortuous, and active endometrial glands.

One spermatozoon pierces the zona pellucida and the nuclear head fuses with the gamete thus effecting fertilization. This unicellular zygote divides after a few hours. Further divisions take place to form a solid 16-cell morula. Fluid collects between these cells to form a blastocyst and the outer zona pellucida disappears. A thickening develops in the wall of the blastocyst and this is called the inner cell mass from which is formed the amnion lined by ectoderm and the primitive gut lined by entoderm. A thickening of ectodermal cells occurs over the area of contact between these two cavities and this is called the primitive streak, from which the fœtus is eventually formed.

These vesicles are surrounded by a cellular mass which is called for convenience the primitive mesoderm (M), and surrounding all this is the trophoblast from which the chorion and placenta will be developed. The trophoblast can be regarded as a sponge-like covering for the remainder of the developing ovum, and it consists of two layers. The deeper layer is cellular, and is called the cytotrophoblast, or cells of Langhans (CT), while the more superficial layer is a

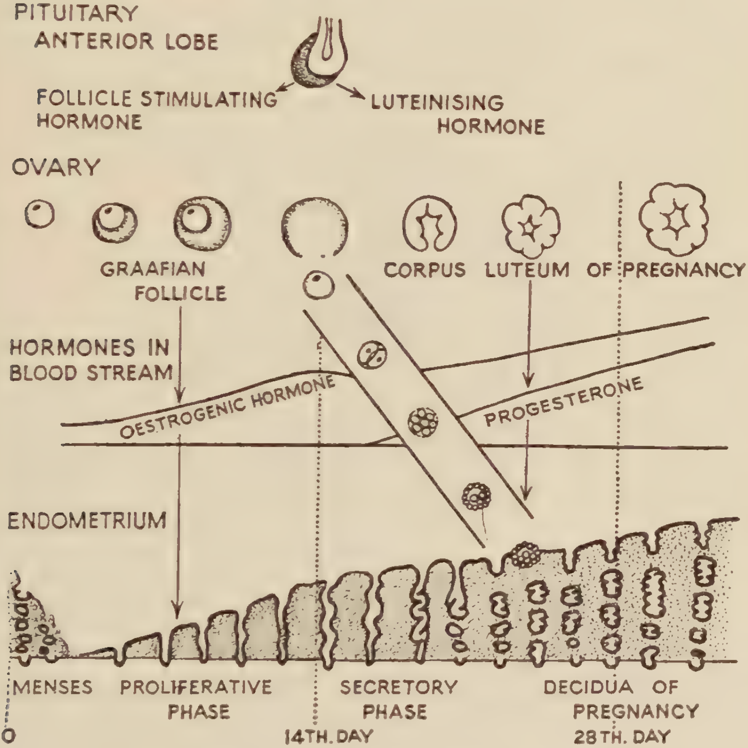


FIG. 8. The Hormone Control of Early Pregnancy.

The hormones secreted by the anterior pituitary control ovulation. The hormones secreted by the ovary govern the growth of the endometrium and the formation of the decidua in preparation for the implantation of the fertilized ovum plasmodial mass called the plasmoditrophoblast (PT) or syncytium, in which masses of protoplasm, undifferentiated into distinct cells, contain numerous scattered nuclei.

It is the trophoblast which is the active agent in the embedding of the embryo. When the embryo, developed to this stage, reaches the uterine cavity, it comes to rest on the surface of the uterine lining. The trophoblast, presumably by some ferment action, now erodes for the embryo a hole in the endometrium (now becoming decidua). Gradually the fœtal structures sink into this hole, and the port of entry becomes closed by a plug of fibrin.

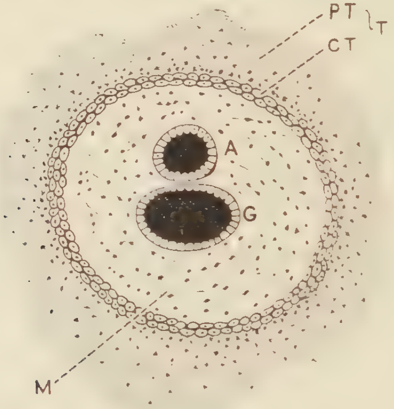


Fig. 9. Very Early Embryo.
PT = Syncytium. CT = Cytotrophoblast. A = Amnion.
G = Gut. M = Mesoderm.
(From Queen Charlotte's *Textbook of Obstetrics.*)

In this process of embedding, blood vessels in the decidua have become eroded and opened. But since these blood vessels are merely of capillary size, only the gentlest oozing of blood results. This blood circulates round the ovum and through the spongework of the trophoblast thus providing nutrients and oxygen from the maternal blood stream.

With further development, the trophoblastic sponge-like arrangement becomes differentiated into a more specialized tree-like arrangement of chorionic villi, and these villi contain blood vessels which have grown out from the fœtus itself. For information as to the steps in the development of the fœtus and the manner in which it becomes surrounded by the amnion, larger books than this must be consulted. It is sufficient here to state that the early ovum, after embedding, soon becomes surrounded by chorionic villi. Internal to this is the amnionic cavity and its lining of amnion. The fœtus is floating in the liquor amnii. Attaching the fœtus to the chorion is a stalk of mesoderm covered by epithelium continuous with that of the amnion. This is the forerunner of the umbilical cord and its distal attachment is to that part of the chorion which is at the spear-point of invasion into the uterine lining. Eventually the chorion in this region will develop itself into the placenta.

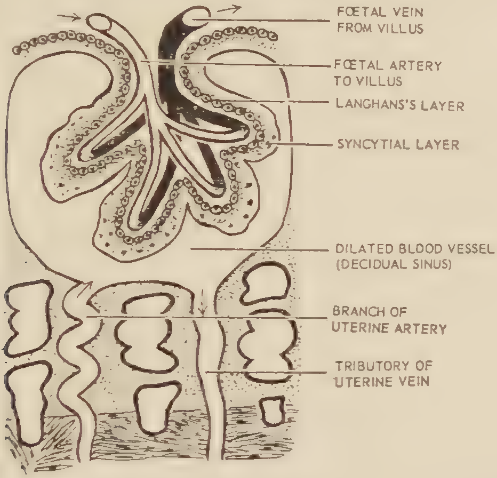


FIG. 10. The Formation of the Placenta (Diagrammatic).

The illustration shows a chorionic villus in a decidual sinus surrounded by maternal blood supplied through branches of the uterine vessels. Arrows show the direction of the blood flow through the villus and the decidual sinus.

Changes in the Decidua

As the ovum embeds itself in the decidua it at first occupies merely a minute cavity. It never erodes to the full depth of the decidua and a layer persists between it and the uterine muscle. This layer is the decidua basalis, and the chorion adjacent to this develops into the placenta.

As the ovum enlarges it raises a capsule of the decidua, which originally formed the covering of the hole in which the embryo was embedded. This capsule is called the decidua capsularis.

The remainder of the uterine lining which is not concerned with the early embedding of the ovum is called the decidua vera.

Development of the Placenta

In the early stages of development the whole of the chorion is covered by villi. With the growth of the embryo the capsule becomes pushed farther and farther away from the uterine wall to which it originally belonged. The villi in relation to the decidua capsularis tend to atrophy, while those in relation to the decidua basalis undergo compensatory hypertrophy. By the twelfth week the villi in the neighbourhood of the decidua capsularis have practically disappeared, while those at the original site of embedding—i.e. in the decidua basalis—have increased to form the fœtal tissues of the placenta. Separation of the placenta during the third stage of labour takes place through maternal tissue, the decidua spongiosus. If the maternal aspect of the placenta is examined it is seen that the chorionic villi are covered by a veneer of decidual tissue.

Placenta succenturiata is the name applied to a small outlying piece of placenta connected with the main mass by a leash of blood vessels. Its formation is the result of an outlying patch of chorionic villi failing to atrophy in the manner usual to villi outside the decidua basalis. During the expulsion of the placenta this succenturiate lobe may sever its connection with the placenta and be retained in the uterus. This will predispose to hæmorrhage and uterine sepsis.

Vascular Arrangement of the Placenta

The erosive activity of the trophoblast opens up maternal blood vessels and permits a free flow of maternal blood around the chorionic villi. Further development of the placenta results in the formation of large intervillous spaces through which a more definite maternal circulation occurs. In addition, the villi have their own blood vessels containing fœtal blood which is circulated by the fœtal heart. Fœtal blood arriving at the placenta by the umbilical arteries, circulates inside the villi themselves and returns to the fœtus by the single umbilical vein. Thus in the placenta there are two circulations—a fœtal circulation inside the villi, and a maternal circulation around them. It will be observed that though there is no admixture of the maternal and the fœtal blood, these two fluids are separated only by the thinnest of "animal membranes". Consequently, diffusion is easy. Fœtal blood, during its passage through the placenta, therefore rids itself of its carbon dioxide and other waste products of metabolism, and takes in instead oxygen and the nourishment required for growth.

The Placenta at Term

This is a flattened discoid mass, about 8 inches in diameter, and weighing about 1¼ pounds. It is 1½ inches thick at the centre and ½ inch thick at the edge. The maternal surface is dark red in colour and feels rough. Frequently also a grittiness due to deposits of lime salts can be palpated. This surface is partially divided into twelve or more lobules or cotyledons by deep furrows, into which decidual tissue penetrates. As has already been said, this surface of the cotyledons is also covered by a layer of decidua which is seen as a thin greyish membrane. The fœtal surface of the placenta is bluish and shiny. It shows no divisions into cotyledons and is covered by the amniotic membrane, which can, however, be peeled away from the surface as far as the attachment of the cord. Stripping the amnion allows a better view of the main fœtal blood vessels, radiating from the point of attachment of the cord following delivery. The veins are full and the arteries empty. The engorgement of the veins is due to the clamping of the cord and the placenta being squeezed by the uterus during the third stage of labour.

The Membranes at Term

The outer membrane or chorion, like the placenta, is a derivative of the trophoblast. It is opaque, friable and thicker than the amnion. It is continuous with the edge of the placenta.

The Amnion

This is tough, thin and translucent. It lies within the chorion, and can be separated from that membrane and from the fœtal aspect of the other trophoblastic structure (the placenta) as far as the attachment of the umbilical cord to the placenta. Here it is seen to be continuous with the epithelium covering the cord. The amnion contains no blood vessels. Within the cavity of the amnion are contained the fœtus, the liquor amnii and the umbilical cord.

The Umbilical Cord

This passes from the umbilicus of the fœtus to about the centre of the fœtal surface of the placenta. Its average length is 20 inches, and it is about as thick as a little finger. It is composed of (1) an outer layer continuous with and morphologically the same as the amniotic epithelium; (2) one umbilical vein and two umbilical arteries; (3) a mucoid connective tissue filling the spaces between the other structures, and called Wharton's jelly; (4) sometimes, near its base, the remains of the yolk sac.

The umbilical arteries take a spiral course around the umbilical vein and this gives the cord a twisted appearance. The umbilical vein contains no valves. The umbilical arteries have a muscular wall and undergo constriction soon after birth, thus preventing loss of blood from the infant and reducing the cardiac pulsations.

The Liquor Amnii

This is the fluid contained in the amniotic cavity, and in which the fœtus floats. It is a clear, slightly alkaline fluid, which consists of water and salts with traces of urea and albumen. Normally colourless, it may be to some extent opaque from suspended fragments of vernix shed by the fœtus, or discoloured from the fœtus having voided meconium into it. Its specific gravity is about 1,008, and an average quantity at term is 1½ pints.

The liquor amnii serves as a medium in which the fœtus can grow freely and move in all directions. It protects the fœtus from injury and equalizes the intra-uterine pressure on the fœtus. During delivery it serves to wash away micro-organisms from the cervical canal.

The liquor amnii is probably secreted by the amnion. Usually also some contribution to its volume is made by the fœtus passing urine into it. That the fœtus secretes urine while *in utero* is certain, because the bladder of a new-born baby contains urine. Such urine contains a good deal of albumen, but not much urea or creatinin.

Common Abnormalities of the Placenta

The placenta may be divided into two or three lobes.

Placenta succenturiata has already been described. If it is retained in the uterus, its absence is detected by finding a hole in the chorion with fœtal blood vessels running out from the placenta and ending at the gap. A loop of aberrant vessels is sometimes seen running from the placental edge on to the membranes and back again.

Red infarcts are pyramidal masses of thrombosed intervillous maternal blood, the apex being towards the fœtus and the base towards the maternal surface. They are usually the result of fibrin deposits which occur on the villus and beneath its syncytium which is destroyed and then becomes the site of a true thrombotic fibrous deposit. White infarcts are merely old red infarcts which have lost the blood pigments and have suffered further deposits of fibrin.

The cord may become excessively twisted, and true knots are found occasionally. It is possible for a true knot to tighten as the fœtus descends in labour and this may obstruct the circulation and cause fatal fœtal anoxia. False knots are merely local bulges giving the appearance of knots. The insertion of the cord into the placenta may not be central, as is normal, but may be into the edge (battledore insertion), or even on to the chorion outside the placenta (velamentous insertion). It is possible that with a velamentous insertion the leash of fœtal vessels may overlie the os uteri and this is called vasa prævia. This condition may be mistaken for presentation of the cord.

CHAPTER SIX

The Anatomy and Physiology of the Fœtus

THE FŒTUS BEFORE TERM

Length. For the first five lunar months of pregnancy the length of the fœtus is conveniently measured by the head-breech measurement. It is approximately the square of the month in centimetres. Thus a three months fœtus measures $3 \times 3 = 9$ centimetres head-breech length.

For the last five lunar months—i.e. the sixth to the tenth month—the over-all length of the fœtus is roughly twice the number of the month in inches. So a child at term (at the end of ten lunar months of pregnancy) should have an over-all length of $2 \times 10 = 20$ inches. The same result is, of course, reached by halving the number of weeks gestation—e.g. a twenty-eight weeks fœtus will have an approximate over-all length of $28 \div 2 = 14$ inches.

Weight. At the end of ten lunar months the child weighs 7 pounds. During the previous two months there has been a weight increase of half a pound per week. Thus, approximate weights are:

6 lunar months child weighs 1 pound;
7 lunar months child weighs 2 pounds;
8 lunar months child weighs 3½ pounds;
9 lunar months child weighs 7 pounds.

General Characteristics at the end of each lunar month:

First month. Chorionic villi surround the ovum and the chorion is separate from the amnion. Human characteristics are not recognizable. There are four branchial clefts. Limb buds are present.

Second month. Extremities are more developed. External genitalia appear. Ossification of clavicle and lower jaw begins.

Third month. Placenta is fully differentiated. Decidua capsularis has been pushed out to and has fused with decidua basalis. Fœtus is about the size of a mouse.

Fourth month. Fœtus is about the size of a rat. The sex is distinguishable. Brain convolutions appear.

Fifth month. Fœtal hair (lanugo) appears. Nails form.

Sixth month. Vernix (sebaceous secretion) appears. Eyelids formed but are adherent.

Seventh month. Child is legally viable.

Eighth month. Child is red in colour and skin is wrinkled. Lanugo is still present but vernix is scanty. Testes of male are in the inguinal canal. Finger-nails extend to the end of the finger pulp. Toe-nails not so well developed.

Ninth month. The finger-nails extend to, but not beyond the end of the fingers. Lanugo hair has nearly gone.

Tenth month. The fully-developed child is plump, pink in colour and smooth of skin. Lanugo hair has gone. Vernix is plentiful. Finger-nails extend beyond the end of the fingers. Toe-nails reach to the end of the toes. Testes of the male are in the scrotum.

THE HEAD OF THE FŒTUS AT TERM

The Sutures of the Cranium. These are the lines of articulation along which the various bones meet and are united by membrane. The frontal suture separates the two frontal bones. The sagittal suture separates the two parietal bones. These two sutures run anteroposteriorly. Running transversely and separating the frontal from the parietal bones is the coronal suture. The lambdoidal suture separates the parietal bones from the occipital bone.

The Fontanelles. These are membrane-filled spaces separating the contiguous angles of bones. The largest is the anterior fontanelle or bregma, which is lozenge shaped and which is situated where the coronal suture crosses the junction of the frontal and sagittal sutures. The posterior fontanelle is triangular in shape, smaller than the anterior, and lies at the posterior end of the sagittal suture, where it joins the lambdoidal.

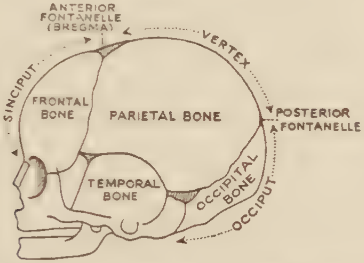


Fig. 11. The Fœtal Skull (sideview), showing the Bones and Fontanelles.

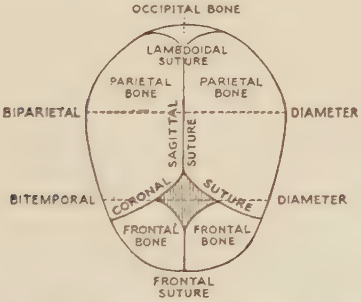


Fig. 12. The Fœtal Skull viewed from above to show the Bones, Sutures, Fontanelles and Transverse Diameters.

The Vault of the Fœtal Skull. For obstetrical purposes this is divided into the occiput behind the posterior fontanelle; the sinciput in front of the anterior fontanelle; and the vertex between these fontanelles anteroposteriorly and the parietal eminences laterally.

Moulding of the Fœtal Head. Owing to the presence of the sutures and fontanelles, and also to the flexibility of the cranial bones, the head can undergo considerable change in shape during its passage through the pelvis in labour. The anterior edge of the occipital bone passes beneath the parietal bones. The posterior edges of the frontal bones pass beneath the parietal bone. One parietal bone overlaps the other along the sagittal suture. This moulding throws strains on the intracranial meningeal septa but, if gradually produced, no harm usually results. If the moulding is excessive as in cases of delivery through a contracted pelvis or produced with undue rapidity or in an abnormal direction, the meningeal septa may tear and give rise to intracranial hæmorrhage. This is most often encountered in difficult breech delivery and in forceps delivery with the occiput posterior.

The Measurements of the Fœtal Head

I. Anteroposterior Diameters. Suboccipito-Bregmatic, from nape of neck to bregma, 3¾ inches.

Suboccipito-Frontal, from the nape of the neck to the most prominent point on the forehead, 4 inches.

Occipitofrontal, from the root of the nose to the posterior fontanelle, 4½ inches.

Mentovertical, from the chin to the vertex, 5¼ inches.

Submento-Vertical, from the angle of the lower jaw to the vertex, 4½ inches.

II. Transverse Diameters. Biparietal, between the two parietal eminences, 3¾ inches.

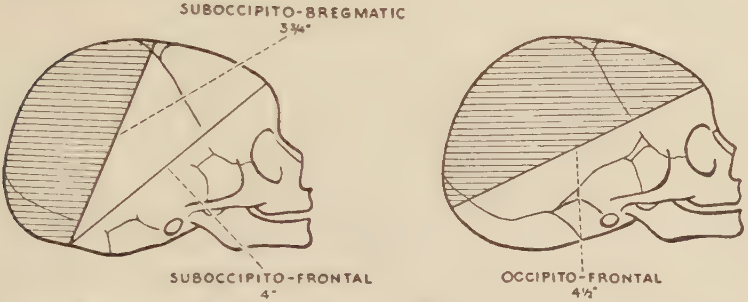
Bitemporal, between the two temporal bones, 3¼ inches.

III. Circumference is measured in the plane of the occipito-frontal diameter, and averages 13 inches.

The Measurements of the Fœtal Trunk which are of importance include:

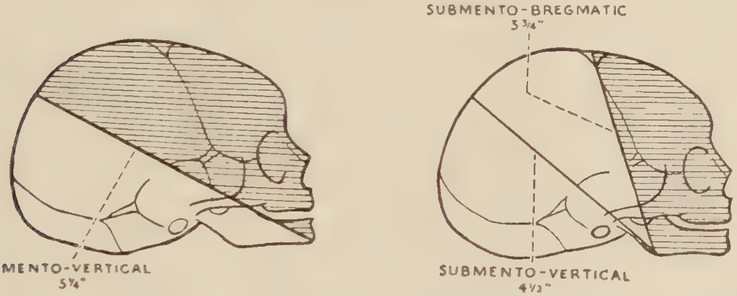
The bisacromial is the widest diameter of the shoulders, 4½ inches.

The bitrochanteric is the widest diameter of the hips, 4 inches.



A. The suboccipito-bregmatic diameter engages in a well-flexed vertex presentation with the occiput anterior. The suboccipito-frontal diameter distends the perineum as the head is born by extension.

B. The occipito-frontal diameter engages when the head is partially extended. This may occur when the position is occipito-posterior.



C. The mento-vertical diameter of 5¼ inches presents in a brow presentation. This will cause obstructed labour.

D. The diameter of engagement in a face presentation is the submento-bregmatic. The submento-vertical diameter is delivered as the head is born by flexion.

FIG. 13. The Diameters of the Fœtal Skull.

Nutrition of the Fœtus

The very early embryo obtains its nourishment from the yolk-sac. Once embedding has taken place, the further nourishment of the fœtus is obtained by absorption from the mother's circulating blood: first, through the chorionic villi surrounding the early ovum; but later through the fully differentiated placenta.

The Fœtal Circulation—Peculiarities

(1) There is a direct communication between the right and left atria by means of the foramen ovale.

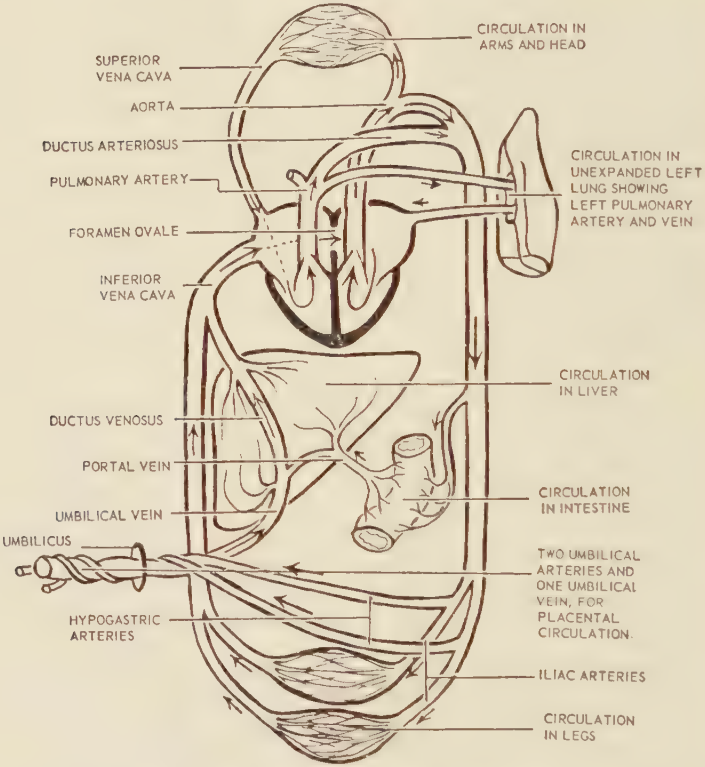


FIG. 14. The Fœtal Circulation before Birth.

The right lung circulation is omitted. Arrows indicate the direction of the blood flow and their size indicates the volume of the flow.

(2) Passing from the pulmonary artery to the aorta is a communicating vessel, the ductus arteriosus, which joins the aorta at a point just beyond the origin of the left subclavian artery.

(3) There is a direct channel of communication between the umbilical vein and the inferior vena cava by means of the ductus venosus.

Course of the Fœtal Circulation. Blood from the placenta, oxygenated and rich in foodstuffs, passes along the umbilical vein and enters the fœtus at the umbilicus. It passes upwards in the falciform ligament to the liver where it joins the left branch of the portal vein. Only a small part of the blood brought by the umbilical vein circulates through the left lobe of the liver, for the greater proportion passes directly along the ductus venosus to the inferior vena cava. By now there has been a small addition of deoxygenated blood from the fœtal abdomen and lower extremities. The blood passes to the right atrium, from which it is guided by the valve of the inferior vena cava through the foramen ovale into the left atrium. Thence it passes to the left ventricle. With the next cardiac impulse it is pumped into the aorta and is distributed mainly by the carotid and subclavian arteries to the head, neck and upper limbs.

The impure blood returning from these parts travels via the superior vena cava into the right atrium, and here this stream crosses the stream from the inferior vena cava already mentioned. Very little admixture of the two streams occurs. The impure blood from the head and upper limbs passes into the right ventricle and with the next heart-beat to the pulmonary artery. From here most of it travels by the ductus arteriosus to the aorta, only a little going to the collapsed fœtal lungs. The main stream passing down the aorta supplies in part the trunk and lower extremities, but mostly travels via the umbilical arteries to the placenta. Here it is reoxygenated and resupplied with nutriment before returning to the fœtus via the umbilical vein and thus beginning the circuit anew.

Changes in the Circulation at Birth. The first observable change is a reduction of pulsations in the umbilical arteries, which constrict and soon prevent further loss of blood from the child. Blood continues to pass along the umbilical vein, but this too is soon prevented by the application of clamps. Birth trauma and exposure of the child immediately following delivery leads to marked skin stimulation. The central nervous system is bombarded with nerve impulses and the first inspiratory gasp is induced. The lungs become expanded and blood becomes oxygenated in the lungs instead of in the placenta. Possibly in response to a raised oxygen tension, the ductus arteriosus contracts and prevents the flow of blood from the pulmonary circulation into the aorta. Since the flow of blood from the umbilical vein has now ceased the pressure in the right atrium falls and the flap valve which guards the foramen ovale closes. These obliterated fœtal vessels eventually become fibrous cords, the ligamentum venosum, the ligamentum teres and the ligamentum arterioriosus.

CHAPTER SEVEN

Changes in the Mother Consequent upon Pregnancy

Changes in the Size, Weight and Position of the Uterus

During pregnancy all the tissues of the uterus undergo hypertrophy, so that the walls—particularly at the placental site—increase greatly in thickness. Towards the end of pregnancy the uterus is about 12 inches long and weighs 2 pounds.

In the first three months of gestation the uterus remains in the pelvis. At the twelfth week its fundus reaches the level of the pelvic brim at about its middle. It is therefore palpable well above the top of the symphysis pubis, which forms merely the anterior boundary of the sloping pelvic brim.

The uterus is normally anteverted at the level of the internal os. Sometimes it may be retroverted at the onset of pregnancy but this malposition is usually corrected by the twelfth week. Occasionally the retroversion will persist and the uterus then becomes impacted within the pelvic cavity at the fourteenth week. This causes stretching and pressure on the urethra with retention of urine, and stimulation of the uterus with a threatened abortion. Should this occur the bladder is emptied and open bladder maintained for 48 hours with the patient in the prone position. This usually permits spontaneous anteversion and the uterine fundus rises into the abdomen.

As pregnancy advances the uterus rises into the abdomen with its longitudinal axis almost in line with the maternal spine. Frequently there is some tilting, generally towards the right. At the same time there is often some degree of rotation on its long axis, again usually to the right, so that the left cornu, with its attached round ligament, which is frequently palpable, becomes deviated from the lateral position towards the midline.

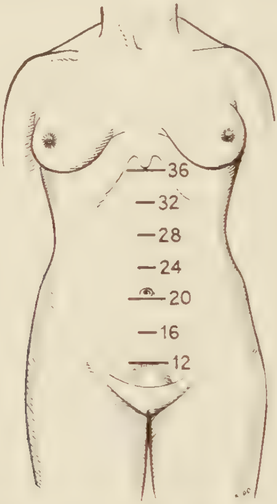


Fig. 15. Height of Uterus from 12–36 Weeks of Gestation.

The Upper and Lower Uterine Segments. There is no gross anatomical distinction, but physiologically there are marked differences. The upper two-thirds of the uterine body which constitute the upper segment do the work of labour, while the lower one-third which constitutes the lower segment becomes thinned out and dilated so as to allow the passage of the fœtus.

Changes in the Cervix Uteri

The cervix becomes slightly hypertrophied, and the mucous glands become more active and produce an increased amount of discharge as a normal occurrence during pregnancy. Owing to venous congestion the cervix appears blue and feels soft after about the twelfth week. The external os may gape sufficiently to admit the finger-tip.

The internal os, however, remains almost completely closed until the onset of labour although the painless contractions of the pregnant uterus usually initiate the stretching and dilatation of the internal os to a slight degree.

Changes in the Vagina

The skin becomes thickened and the muscular coats hypertrophy. The vagina increases greatly in elasticity and is capable of enormous distension without damage during delivery. Increased vascularity occurs, and this causes a purple discoloration and a soft velvety feeling which is characteristic of pregnancy.

Changes in the Ligaments

The broad and round ligaments are enlarged and lengthened as the uterus rises. Stretching of the round ligaments sometimes gives rise to pain situated at their points of attachment, i.e. at the two cornual angles and in the groins.

Changes in the Abdominal Walls

As the uterus enlarges it gradually distends the abdominal walls, so that towards the end of pregnancy the recti muscles may be divaricated, and the umbilicus so stretched as to be flush with the surrounding skin. The hormonal changes of pregnancy together with some stretching causes rupture of elastic fibres of the skin with subsequent atrophy and fibrosis. These striæ gravidarum may be seen over the lower abdomen, the upper and outer aspects of the thighs, the breasts and the deltoid region. At first the streaks are pink in colour, but subsequent to delivery the pink colour disappears and the striæ become silvery in appearance. Running in the midline from the pubes to the umbilicus or slightly higher is found a line of dark pigmentation (the linea nigra).

Pressure on the Pelvic Contents

Occasionally, irritation of the bladder, constipation, œdema, and varicose veins of the legs and vulva may occur from pressure of the enlarged uterus on the bladder, rectum, sacral plexus and iliac veins respectively.

Changes in the Blood and Circulatory System

Towards the end of pregnancy there is a considerable hydræmia, the diluting effect of which upon the blood picture is to some extent compensated by a slight increase in the number of red corpuscles and in the hæmoglobin. Many women, however, show a real degree of microcytic hypochromic anæmia caused by an iron deficiency. This may result from a diet which is poor in iron, from inadequate iron absorption and from the increased iron requirements of the fœtus. Many obstetricians prescribe iron by mouth to all pregnant women as a prophylactic measure. The administration of ascorbic acid, which presumably acts mainly as a reducing agent, is often a valuable additional treatment. On rare occasions the anæmia will not respond to iron and the more serious megaloblastic anæmia of pregnancy should be suspected. This responds to folic acid by mouth.

The blood urea is low (20 milligrammes per 100 ml. blood). The blood pressure falls in the middle trimester but rises again slightly in the later weeks; a considerable rise would of course suggest pre-eclampsia. The heart usually hypertrophies to some extent and there is an increased cardiac output throughout most of the pregnancy, but this falls again during the last four weeks.

Changes in the Skin

In addition to the linea nigra the brown pigmentation about the forehead, face, umbilicus and external genitalia is common. The pigmentation, which on the face may be quite disfiguring, tends to diminish greatly after delivery.

Changes in the Urinary System

The amount of urine secreted is greater than normal, but there should be no alteration in its composition. If a reducing substance appears in the urine and the Benedict's test is positive its nature must be investigated by yeast fermentation and ozazone tests. It must not be presumed to be lactose, which rarely appears in pregnancy.

In early pregnancy the anteverted gravid uterus may rest heavily on the bladder and cause frequency of micturition which subsides about the sixteenth week. It may, however, reappear in the last few weeks of gestation, when the fœtal head settles down into the pelvic brim.

The Ureters. These tend to dilate during pregnancy, and so, by permitting urinary stasis, favour the onset of infection. This dilatation is due mainly to the hormones of pregnancy reducing muscle tone, but it may also be made worse by the pregnant uterus pressing on the ureter as it crosses the pelvic brim, since the dilatation is seen mainly above this level.

Changes in the Digestive System

The appetite is often capricious, and a very early sign of pregnancy is frequently a change in the patient's taste for food or drink. Nausea and vomiting, particularly in the morning, are common from just after the first missed period until the sixteenth week. Constipation is very common, and needs attention by the regular administration of mild laxatives and a greater amount of cellulose "roughage" in the diet. Dental decay if present tends to progress rapidly and the teeth of all pregnant women should be under the care of a dental surgeon. Profuse salivation is a rare and troublesome symptom.

Changes in the Weight of the Body

In the first three months there is often a slight loss of weight associated with vomiting, but subsequently the body gains in weight independently of the uterus and its contents. The over-all increase by the end of pregnancy should not exceed two stones (28 lb.). A too rapid increase in weight—over 5 lb. per month—is indicative of water retention and the possible onset of pre-eclampsia. An increase of 10 lb. or more between the twentieth and the thirtieth weeks of gestation is said to be a particularly valuable indication that pre-eclampsia may supervene later.

Changes in the Breasts

At about the sixth week of pregnancy slight enlargement and increased warmth is noticeable. The breasts are tender, and may have a knotty feel at the periphery. By the twelfth week, owing to hypertrophy of the glandular and connective tissue elements, there is obvious enlargement of these organs and secretion can be expressed from the nipple. The areola of the nipple becomes pigmented and this is particularly marked in coloured races. Later in pregnancy a further ring of pigmentation may occur in the breast skin immediately surrounding the nipple and this is known as a secondary areola. At the eighteenth week of pregnancy distended superficial veins are seen running beneath the skin. The sebaceous glands of the primary areola become enlarged to form small raised tubercles called Montgomery's follicles.

Changes in the Thyroid Gland

Enlargement of this gland and increased physiological activity are occasionally noted.

CHAPTER EIGHT

Symptoms and Signs of Pregnancy

SYMPTOMS

1. *Amenorrhœa.* This is the first symptom of pregnancy and the sudden cessation of the periods in a healthy woman of child-bearing age usually means pregnancy.

In the first three months of pregnancy, before the uterine cavity is obliterated, it is theoretically possible for menstruation to occur. The losses that sometimes do take place at more or less monthly intervals during early pregnancy are, as a rule, somewhat different from a normal period, and are best regarded, not as menstruation, but as a threatened abortion.

2. *Nausea and Vomiting.* This occurs in 50 per cent. of pregnant women. It is usually most marked in the morning, but may occur at any time of day or night. In anxious patients this symptom may sometimes be relieved by small doses of phenobarbitone. In other cases the antihistamine drugs—for instance Ancolan 25 mg. twice daily—are very helpful. The symptom usually ceases to be troublesome after the sixteenth week.

3. *Breast Symptoms.* Enlargement, tenderness and pricking sensations may be noticed as early as the sixth week. By the twelfth week, secretion issuing from the nipple may have been seen. Support by a well-fitting brassiere with a wide shoulder strap is an important routine for all pregnant women.

4. *Frequency of Micturition* from about the eighth to the fourteenth week may be due to the pressure of the pregnant uterus on the bladder.

5. *Constipation* often becomes troublesome.

6. *Quickening* is the sensation produced by the movements of the fœtus *in utero*, and is generally first felt at the eighteenth week when the joint cavities have formed. Initially feeble and fluttering in character, these movements may not be recognized by the mother for what they are. Gradually they become stronger, and may be felt as distinct kicks.

If the movements of the child are felt or seen by the obstetrician they constitute definite evidence of pregnancy; if only perceived by the mother, the sign is very much less valuable; she may be deceived by the sensations caused by flatus.

Violent movements of the fœtus may precede fœtal death *in utero*, but in many cases fœtal movements cease for days at a time though the pregnancy is proceeding quite normally. Hearing the fœtal heart sounds is proof that fœtal life continues.

SIGNS

1. *Enlargement of the Uterus*. By the sixth week some enlargement can often be detected on bimanual examination. From the eighth to the tenth week of pregnancy the uterus seems to consist of three parts: (*a*) a globular enlargement of the upper uterine segment, (*b*) a relatively firm cervix and (*c*) an intervening area which is soft and empty and therefore almost impalpable. This triad is known as Hegar's sign. Overzealous attempts to elicit this sign may precipitate an abortion.

At the twelfth week the fundus uteri reaches the level of the pelvic brim at about its centre. Because of the obliquity of the pelvic brim, the fundus uteri can now be felt through the abdominal wall at about three finger-breadths above the symphysis pubis.

Subsequent to the twelfth week the height of the fundus is related to the umbilicus. At twenty weeks the fundus is level with the umbilicus and movements will have been felt for two weeks. Later in pregnancy the height of the fundus much depends upon the size of the fœtus and the engagement of the head and is subject to considerable variation.

During the last six weeks of pregnancy the girth of the abdomen at the level of the umbilicus in inches is approximately equal to the duration of pregnancy in weeks.

2. *Softening of the Cervix.* Blue or purple coloration of the cervix and vagina has previously been mentioned.

3. *Breast Changes.* These have been described in detail.

4. *Intermittent Contractions of the Uterus.* These can be palpated by the abdomen after the fourteenth week. If felt with certainty, they prove that an abdominal mass is uterine.

5. *The Uterine Souffle.* This is a blowing noise, synchronous with the maternal pulse, heard over the lateral aspects of the uterus by means of a stethoscope. It is due to maternal blood pulsing through the tortuous uterine arteries.

6. *Ballottement.* Internal ballottement can be obtained from about the sixteenth to the thirty-second week. A finger is placed in the anterior or posterior fornix of the vagina and pushed suddenly against the fœtus, which lies free in the liquor amnii. The fœtus recedes and then falls back on the finger-tip causing a characteristic sensation. External ballottement is felt on abdominal examination and is obtained by a gentle shake applied to the uterus. The sensation of a solid body (the fœtus) floating freely inside the uterine cavity is quickly learned at an antenatal clinic. It can be felt from the eighteenth to the thirty-sixth week.

7. *Fœtal Parts and Fœtal Movements.* These can be felt on abdominal examination from about the twenty-fourth week of pregnancy onwards.

8. *Fœtal Heart Sound.* These sounds can sometimes be heard as early as the sixteenth week. They are usually audible by the twentieth. They have the biphasic quality of the adult heart. They must not be confused with (*a*) transmitted maternal heart sounds; (*b*) transmitted sound from the

maternal aorta; (*c*) thuds due to fœtal movement; (*d*) sounds produced by flatus in the maternal intestine.

The fœtal heart rate is normally 120–150 per minute, but is slightly increased at the beginning of each labour pain. It is decreased at the height of the contraction owing to the interference with the placental circulation by increased intra-uterine pressure.

The fœtal heart sounds are best heard through the back of the fœtus. Thus, when the vertex presents, and when the back is to the left and in front (first position), the fœtal heart is heard at the midpoint of the line joining the umbilicus of the mother to the left anterosuperior iliac spine. The heart sounds can also be transmitted through the child's chest, and it is usual in cases of posterior position of the back to hear the fœtal heart not only far out in the mother's flank but also near her umbilicus. Therefore, hearing the heart sounds in the midline in front does not necessarily denote that the back is anterior. In cases where the child presents by the breech, the fœtal heart is heard at a higher level.

Ballottement of the fœtus, fœtal movement felt through the abdominal wall and fœtal heart sounds are absolute signs of pregnancy.

9. *X-Rays.* The introduction of X-rays have provided the obstetrician with a valuable diagnostic tool. A straight radiogram of the abdomen may demonstrate fœtal bones from the sixteenth week onwards. The exact position of the fœtus is determined. The presence of twins and bony fœtal abnormality may be revealed. Radiological methods are frequently used to assess the size of the maternal pelvis and the maturity of the fœtus.

10. *Biological Pregnancy Test.* This test depends on the presence in the urine of a pregnant woman of chorionic gonadotrophin, which is an ovary-stimulating hormone derived from the chorionic tissue. Its action is similar to the gonadotrophic hormones of the anterior pituitary. Prepared urine is injected into immature animals and the effects of the

hormonal stimulation are observed. The formation of a corpus luteum may be seen in the rabbit (Friedman's test), the mouse and the rat (Aschheim-Zondek test). The female Xenopus toad will lay eggs within a few hours (Hogben test). Spermatogenesis is induced in the male frog. The tests are usually reliable in the first three months of pregnancy but thereafter false negatives are common. In some series false positive results were obtained in 2 per cent. and false negative results in 10 per cent.

11. *The Funic Souffle.* This rarely obtained sound is of blowing character and synchronous with the fœtal heart. It is due to the pulsation of fœtal blood in the umbilical cord, which is compressed either by the stethoscope used for auscultation or by the fœtus against the uterine wall.

Differential Diagnosis of Pregnancy from Ovarian and Fibroid Tumours

The presence of the signs of pregnancy in a case of pregnancy, and the absence of these signs in cases of ovarian tumour or uterine fibroids usually makes the diagnosis clear. Furthermore, in the case of fibroids, the hard and often nodular tumour mass is characteristic. The smooth fluctuating mass of an ovarian cyst may resemble a pregnant uterus but it will, however, yield none of the absolute signs of pregnancy. Occasionally pregnancy is complicated by an ovarian or fibroid tumour, and the diagnosis of pregnancy then becomes difficult; in such cases the abdominal tumour will often be found to be of unsymmetrical shape—a distinct depression may be found between the tumour and the uterus. The detection of the softened cervix and of the fœtal heart sounds will clear up the diagnosis.

Differential Diagnosis of Pregnancy from Ascites

The absence of all the important signs of pregnancy and of any defined uterine tumour together with the presence of fluctuation, dullness of the flanks, shifting resonance and symptoms and signs directly related to the underlying tumour will serve to distinguish ascites from pregnancy.

Spurious Pregnancy

Occasionally, women, usually at about the time of the menopause, develop abdominal enlargement and, wishing for a pregnancy, get a firm idea that this has occurred. The symptom-complex of amenorrhœa (due to the menopause), enlarged abdomen (due to deposition of fat plus hysterical depression of the diaphragm), sensation of fœtal movements (a mistake which results from the woman becoming conscious of her own intestinal movements), can easily delude the woman. The physicians should have no difficulty in excluding pregnancy by the absence of uterine enlargement and the other signs of pregnancy, and by the fact that the abdominal bulging disappears under anæsthesia.

Estimation of the Day of Confinement

Since the duration of pregnancy varies in different women, it is not possible to say precisely when labour will start. Assuming a 28-day menstrual cycle the average duration of pregnancy is 280 days from the first day of the last menstrual period. A simple and approximate method is to take the first day of the last menstrual period, and to add nine months and seven days. Thus, if the last period began on January 2nd, 1963, the calculation will be:

$$\begin{array}{lll} 2 & 1 & 1963 \\ 7 & 9 & \\ \hline 9 & 10 & 1963 \\ \hline \end{array}$$

Thus, the confinement may be expected about October 9th, 1963.

In cases where the patient's menstrual history is indefinite, a very rough idea when the confinement is due can be obtained by noting the date of quickening (18 weeks) and the date when the uterine fundus reaches the level of the umbilicus (20 weeks). Then, taking the duration of pregnancy to be forty weeks, a simple calculation will give some idea when labour may be expected. But it must be realized that this method is capable of very considerable error.

CHAPTER NINE

The General Management of Pregnancy

1. *Dress*

The desire to conceal their condition leads many pregnant women to wear their clothing too tight. This causes discomfort and pressure on the breasts or the abdomen must be avoided. The enlarging breasts should, however, be prevented from drooping by a well-fitted brassiere. A properly fitting maternity corset may be required if there is a tendency to pendulous abdomen in the multiparous patient, but in general a light suspender belt which will keep her comfortable is all that the pregnant patient need wear. Garters must never be worn. They predispose to the appearance of varicose veins on the legs.

2. *Diet*

Once the initial nausea is over, the gravid woman usually has a better appetite than usual. Generally speaking, the diet can be left to the woman's own tastes and appetite.

There is no need to limit the protein intake. The daily protein requirements of a pregnant woman are in the neighbourhood of 1·5 to 2 grammes per kilogram of body weight. It is probable that the pregnant woman is in danger of getting too little rather than too much protein. A sufficiency of the necessary vitamins is provided in the milk, eggs, butter, cheese, fruit, green vegetables and salads which form part of the average diet when food is plentiful. When the cost of food is high it is probable that the diet of many a pregnant woman is deficient. It is, therefore, highly desirable that every pregnant woman should receive daily two pints of milk—valuable for its protein, its calcium and its vitamins A and D. Pregnant women can obtain free of charge tablets containing vitamins A, B, C and D. In addition a high iron intake can be ensured by giving ferrous gluconate, one tablet three times daily by mouth. Alcohol taken in strict moderation is not harmful. Smoking should be discouraged.

3. *Skin*

A daily warm bath, with careful cleansing of the vulva and perineal skin is recommended.

4. *Nipples*

Excessive pressure on the nipples is to be avoided. Retracted nipples may be drawn out daily with the fingers and so made suitable for breast feeding. If the nipples are retracted a Waller nipple shield worn under the brassiere will encourage normal eversion. The nipples should be washed daily since dried breast secretion may cause excoriation and skin infection. Vigorous scrubbing and the application of spirit is condemned.

5. *Teeth*

If dental caries is present, this will progress more rapidly in pregnancy. The dentist should be visited frequently and the teeth brushed after every meal.

6. *Exercise*

A daily walk is beneficial and gentle exercise can often be taken right up to term.

Riding, dancing, swimming and tennis should be avoided. In every case of second pregnancy following a first pregnancy which terminated in abortion, sexual intercourse, all forms of exercise except walking and all forms of travel over long distances must be forbidden until after the fourteenth week.

7. *The Bowels*

Constipation is common during pregnancy and must be overcome by increased cellulose "roughage" in the diet, extra fluid intake or by the regular administration of mild laxatives such as Dulcolax or Sennakot. Strong purgatives may cause abortion and must be avoided. Liquid paraffin should not be taken regularly as this may interfere with the absorption of vitamins.

8. *The Urine*

This is tested for the presence of albumin and sugar at each antenatal visit which is monthly until thirty-two weeks, fortnightly until thirty-six weeks and then weekly until delivery.

9. *The Blood Pressure*

This should be taken each time the urine is tested.

10. *Antenatal Examinations*

These should be made frequently. The primary examinations, to which others will be added according to need, are:

(*a*) *Early in Pregnancy*. The points for consideration are: (1) the diagnosis of pregnancy and the exclusion of a retroverted gravid uterus and pelvic tumour; (2) the history of previous illness and of previous pregnancies and labours; (3) general physical examination including the colour of the mucous membranes, heart, lungs, breasts, teeth, urine and blood pressure; (4) advice on diet, hygiene, care of the bowels, etc.

(*b*) *At Twenty Weeks*. The duration of amenorrhœa is correlated with the size of the uterus and date of quickening.

(*c*) *At Thirty-two Weeks*. Now it is necessary to know if the breech is presenting and, if necessary, arrangements are made for the performance of external cephalic version. Early version has the advantage of being easily performed and so carrying a diminished risk of placental separation or induction of labour. Should version be found impossible then further attempts should be made at weekly intervals until the thirty-sixth week, when many obstetricians may wish to make a further attempt under general anæsthesia. Anæsthesia always encourages excessive force and this may submit the fœtus to risks which exceed breech delivery.

(*d*) *At Thirty-six Weeks.* An internal examination can now be made without causing pain. The size of the bony pelvis and the resistance of the pelvic floor is assessed. At and after the thirty-sixth week the fœtal head should be sunk well into the brim in all primigravidæ. A list of the causes of failure of the fœtal head to "engage" in the brim in a primigravida will be discussed later.

CHAPTER TEN

Disorders of Pregnancy

These may be considered under the following headings:

A. Abnormalities of the ovum.
B. Diseases which are accidental complications of pregnancy.
C. Diseases due to pregnancy.

A. Abnormalities of the Ovum

1. HYDRAMNIOS

Definition. An excessive amount of liquor amnii. The normal amount varies considerably, and an excessive quantity may be taken as an amount in excess of 4 pints.

Causation. Unknown. That the cause may be fœtal is suggested by the frequent association with fœtal abnormalities, such as spina bifida or anencephaly. Moreover, hydramnios not uncommonly occurs in one sac of a twin pregnancy.

In other cases, it looks as if the cause were maternal, for example when hydramnios is associated with toxæmia of pregnancy, maternal heart or renal disease, or with diabetes mellitus.

Varieties. (*a*) Acute Hydramnios is extremely rare. It tends to appear about the middle of pregnancy, especially of a uniovular twin pregnancy. The rapidly accumulated fluid causes serious symptoms—pain, breathlessness, orthopnœa, and even cyanosis. The appearance of the case may suggest cardiac disease. Dyspepsia and perhaps vomiting may occur.

On examination, the tensely distended uterus will be felt, probably filling the abdomen. It will yield a fluid thrill in all directions and ballottement will be obtained by the internal method. The treatment of acute hydramnios is to terminate the pregnancy by rupturing the membranes.

(*b*) Chronic Hydramnios. This is more common. The fluid begins to collect about the middle of pregnancy. Since the accumulation is gradual there may be an enormous distension of the uterus which is sometimes permitted without the causation of any symptoms other than those due to mechanical factors. Thus the patient may complain of a large abdomen, of breathlessness, of palpitation, and of œdema of the legs, and yet give no appearance of being ill.

On examination the abdomen is found to be uniformly distended, and the girth 40 inches or more. The uterus feels tense and elastic and it never seems to relax. A fluid thrill is well marked, and ballottement easily detected. The fœtal parts will be difficult to palpate because the uterus is tense and the fœtus floats away from the examining hand. The diagnosis of twins cannot be made, though this condition may be suspected. The fœtal heart sounds are indistinct. On vaginal examination the lower pole of the uterus is found to be distended.

The differential diagnosis is from:

1. Twins. When twins and hydramnios coexist, the diagnosis is difficult. X-ray examination may help.

2. Ovarian cyst. Here the signs of pregnancy will be absent. If pregnancy is complicated by an ovarian cyst, the diagnosis is difficult and depends on the discovery of a line of demarcation between the pregnant uterus and the cyst.

3. Ascites. Here the other signs of pregnancy will be missing, and the characteristic percussion signs of ascites present.

4. Hydatidiform mole. This is not often a source of difficulty. Generally speaking, hydatidiform mole occurs much earlier in pregnancy than does hydramnios even of the acute

variety and the uterus rarely rises above the umbilicus. Hydatidiform mole is generally associated with an appearance of illness and of pre-eclampsia. The blood pressure is likely to be raised. The uterus enlarged by a mole of this type does not yield a fluid thrill, and there is usually some discharge of blood and perhaps vesicles. Diagnosis is aided by finding the biological pregnancy test to be positive in high dilutions, e.g. 1 in 500.

Effects on Labour. The excessive distension of the uterus is apt to lead to inertia. Sometimes the os will dilate to the size of half a crown, after which no increase takes place. At this point it is advisable to rupture the membranes, after which labour is often completed rapidly. There is always the danger of prolapsed cord. When the membranes are ruptured, the puncture is made between contractions and the hand is kept in the vagina to allow the liquor to escape slowly. Ergometrine is given with the delivery of the fœtal shoulders and this reduces the risk of post-partum hæmorrhage.

Treatment. When the patient comes into labour spontaneously the requisite treatment is outlined above. In other cases the symptoms call for relief before the onset of labour. Near term, this relief is best supplied by rupturing the membranes, and so bringing on labour. If, because of the severity of the symptoms, it is wished to remove some of the liquor from the uterus, and yet to minimize the probability of bringing the patient into labour, this can sometimes be done by tapping the uterus through the abdominal wall by means of a long hollow needle, such as a spinal puncture needle. Such a case would be one in which the fœtus is distinctly premature but otherwise appears normal to radiological examination.

2. OLIGOHYDRAMNIOS

This is a deficiency of liquor and is rarely encountered. It has been suggested that this may predispose to amniotic adhesions, which cause constriction of the fœtus and limb amputations. This now seems unlikely and absent limbs probably result from arrested development. It is now recognized that certain drugs, such as thalidomide, taken by the mother in early pregnancy may have a toxic effect upon the fœtus and cause various congenital abnormalities of the limbs.

3. OTHER FŒTAL ABNORMALITIES

Some of these may give rise to difficulty in labour. Examples of fœtal abnormalities are hydrocephalus, meningocele, exomphalos, spina bifida, ascites, etc.

4. PREMATURE EXPULSION OF THE OVUM

Abortion or miscarriage is the expulsion of the fœtus or products of conception before the twenty-eighth week of pregnancy, when the fœtus is said to have become "viable" and in law is capable of an independent existence. It is estimated that 10 per cent. of all pregnancies end in spontaneous abortion and a further 7 per cent. are criminally induced. Abortion remains the commonest cause of fœtal loss and may be responsible for serious maternal morbidity.

Causes

1. A malformed or blind ovum is probably the commonest cause. The fœtus is missing and the chorionic sac may show early vesicular formation.

2. When abortion occurs repeatedly it may be due to a deficiency of progesterone. Good results are claimed for the weekly injection of 250 mg. until the twentieth week.

3. Congenital malformations of the uterus may interfere with implantation of the ovum.

4. If retroversion of the uterus persists impaction results at about fourteen weeks. There is difficulty in passing urine and signs of early abortion.

5. Uterine fibroids which encroach upon the uterine cavity may disturb normal implantation.

6. Acute maternal disease, such as pyelitis or other

intercurrent infection may cause abortion and particularly in the presence of high pyrexia.

7. Chronic maternal disease such as chronic nephritis, diabetes mellitus, thyroid deficiency and lead poisoning may be responsible.

8. Congenital deficiency or traumatic damage to the cervix may result in an incompetent internal os. Pregnancy progresses normally until about twenty weeks when the membranes rupture as a result of cervical dilatation and the fœtus is subsequently lost.

9. Criminal abortion is usually attempted by the administration of certain drugs in toxic dosage. These include violent purgatives, ergometrine, quinine and drugs used in the treatment of cancer. The introduction of instruments or irritating fluids such as soap solution are common methods. The uterus is atonic and hæmorrhage is often severe. The fœtal membranes and blood clot serve as an ideal medium for bacterial growth and sepsis.

Clinical Varieties of Abortion

(*a*) Threatened. There is painless uterine bleeding from the raw surface of the uterus left by separation of the ovum.

(*b*) Inevitable. In addition to bleeding, which is often severe, the os uteri has become dilated in response to intermittent uterine contractions which cause colicky pains in the lower abdomen.

(*c*) Complete. This term designates an abortion which is finished, and in which all the uterine contents have been expelled.

(*d*) Incomplete. This term is used for an abortion, which has not been entirely finished, some of the uterine contents being retained.

(*e*) Septic. When infection becomes superimposed upon an incomplete abortion and pyrexia develops, the condition is described as a septic abortion.

(*f*) Habitual. Three consecutive abortions usually implies a maternal factor, which may be a progesterone deficiency.

(*g*) Missed. As has been pointed out, when a woman has a threatened abortion, the bleeding is consequent upon separation of part of the ovum. If this separation has resulted in fœtal death, the abortion nearly always proceeds to become inevitable and finally complete. In rare cases such a dead pregnancy is not expelled, but is retained. It is then called a "missed abortion".

Symptoms of Abortion

The cardinal symptom is bleeding. At first this is slight but becomes more profuse and is then accompanied by painful uterine contractions. The standard by which we recognize that a miscarriage has become inevitable is the finding on vaginal examination that the cervix is dilated and that some of the ovum is projecting through it. When the ovum is expelled in early pregnancy it comes out entire, and may be missed in the blood that is also passed. In later weeks the fœtus is first delivered, and is followed after a time by the placenta and membranes.

Treatment

Preventive treatment in cases of abortion depends on the cause. The oral administration of potent progesterins may be of benefit in cases where progesterone deficiency is suspected. Late abortion, suggestive of an incompetent internal os, can be effectively prevented by the insertion of a nylon tape into the cervix at about sixteen weeks so that the internal os is constricted. This Shirodkar suture prevents premature rupture of the membranes and is removed at thirty-eight weeks when the fœtus is mature. A retroverted gravid uterus that does not show signs of spontaneous ascent at about the twelfth to the fourteenth week, should have its position gently corrected and a ring pessary fitted. When no cause can be discovered for habitual abortion prophylaxis is based upon prolonged bed rest.

Threatened abortion is treated by rest, pethidine and barbiturates. Purgatives must be avoided. When the bleeding has subsided the patient must exercise great care, avoiding sexual intercourse, any form of violent exercise, and resting in bed over the time when the next two menstrual periods would normally have occurred. The stay in bed should be for the duration of the bleeding and for two more days after all hæmorrhage has ceased.

Inevitable abortion usually proceeds without any special treatment, but care must be taken to see that all the ovum has come away. In some cases the severity of the bleeding calls for more active measures. Oxytocic drugs such as ergometrine or oxytocin will encourage the uterus to evacuate fully. If this fails the uterus should be emptied under anæsthesia by dilating the cervix and introducing the gloved finger, which frees all the attachments of the ovum. Finally the ovum is pulled out with a sponge forceps. Plugging the vagina is to be avoided as this encourages infection.

Incomplete Abortion. When products of conception have been recognized and when bleeding continues, the uterus is evacuated without delay.

Septic Abortion. Bacteriological swabs are taken for culture and sensitivities. Meanwhile the infection is brought under control with a broad spectrum antibiotic. Blood transfusion is given to counteract heavy blood loss. Polyvalent anti-gas gangrene serum 20,000 units every 3 hours is given by intramuscular injection for three doses. Under antibiotic cover the uterus is evacuated.

5. CARNEOUS MOLE

When a uterus contains a "missed abortion" further areas of chorionic separation sometimes follow, and these are accompanied by small hæmorrhages. Part of this blood escapes by the vagina, and part clots in the space between the chorion and the decidua. At the same time the dead fœtus shrinks and the amniotic cavity decreases in size, so that eventually a "carneous mole" is produced. In time this is expelled usually in fragments and to the accompaniment of uterine hæmorrhage. Occasionally it is entire and then it is about the size of a duck's egg. The outer surface is rough, and the outer wall, about ½ inch thick, consists of the accumulated intra-uterine blood clots with the remains of the chorionic villi. On section is found the amniotic cavity containing an atrophied fœtus. The wall of the cavity is bulged inwards in many places corresponding to the hæmorrhages in the choriodecidual space.

Clinically, there are four stages: first, the stage of an early normal pregnancy. Then the stage of what appears to be a threatened miscarriage, but this is complicated by the fact that the fœtus has died. Third, the stage of retrogression of the signs of pregnancy, the breasts shrink and the uterus which is bulky fails to enlarge. At the same time there is a brown discharge from liquefaction of the intra-uterine blood clot, and this discharge is punctuated by further slight hæmorrhages, corresponding to each successive chorionic separation and choriodecidual hæmorrhage. The treatment at this stage is to await spontaneous evacuation. If, after the lapse of two to three months, it has become certain that no further uterine enlargement is taking place, an attempt to make the uterus empty itself may be made by giving stilbœstrol 5 mg. three times daily for three days in an effort to sensitize the uterus to oxytocic drugs. On the fourth day an oxytocin drip is given. If this fails, digital emptying of the uterus under anæsthesia is required. This should be done only in hospital for there is a considerable danger of hæmorrhage. More usually, before such measures are demanded, the fourth stage, that of expulsion, occurs spontaneously. This stage is managed just as would be an ordinary miscarriage.

6. HYDATIDIFORM OR VESICULAR MOLE

This change usually happens early in pregnancy and is essentially one of hypertrophy of the coverings of the chorionic villi (syncytium and Langhans's cells), and œdema of the core of the villi with an absence of functioning vascularization. The result is that clusters of semi-transparent vesicles with altered blood in the interstices, replace the ovum; for no trace is usually found of fœtus or amniotic cavity. In rare cases, however, only part of an ovum undergoes hydatidiform change.

The normal trophoblastic epithelial elements have, as has been seen, a power of erosion into the lining of the uterus. This erosive activity is increased in cases of hydatidiform mole which may penetrate the full thickness of the uterine wall.

Hydatidiform mole is complicated in about half the cases by bilateral theca-lutein cysts of the ovaries. The cysts reach the size of a clenched fist but disappear spontaneously when the mole has been evacuated.

Diagnosis

A woman with an early pregnancy develops hyperemesis gravidarum (severe vomiting) and the signs of pre-eclampsia (hypertension, albuminuria and œdema). The uterus may be larger than the dates would suggest and it feels boggy. No fœtal heart is heard and ballottement is absent. There is usually a brown vaginal discharge and the diagnosis is established when characteristic vesicles are passed. The biological pregnancy test may be positive in dilution 1 in 500.

Treatment

Frequently the mole is spontaneously aborted, and the case is treated as an incomplete miscarriage. When this does not happen, but the diagnosis has been made certain, the uterus should be emptied or removed. In a woman over

40 years total hysterectomy is probably the best treatment. In younger women, some advise emptying the uterus by abdominal hysterotomy. The more usual practice is to dilate the cervix, squeeze out as much of the mole as will come away, and digitally to peel off the uterine wall what remains.

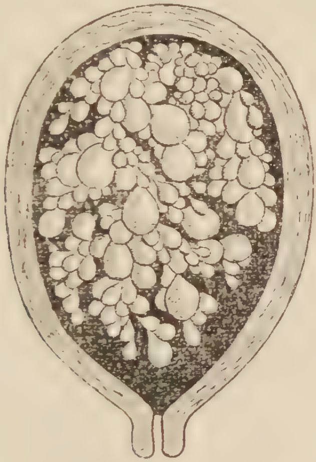


FIG. 16. Hydatidiform Mole.

Great care must be exercised in doing this, since, in some cases, the thinned uterine wall is easily perforated.

Chorionic Epithelioma. This may follow hydatidiform mole, abortion, or pregnancy at term. It is a relatively rare condition in Great Britain. There is an absence of villous formation and the trophoblastic elements have the characteristics of highly malignant tissue. The diagnosis is suggested if bleeding recurs after a hydatidiform mole has been evacuated and if the biological pregnancy test becomes positive 1 in 200 after having been negative. The prognosis is poor. The current treatment is total hysterectomy with preservation of ovaries followed by very heavy œstrogen therapy and deep X-rays. Treatment with cytotoxic drugs is under trial and shows promise of being more effective.

7. ABNORMALITIES AND DISEASES OF THE PLACENTA

Many of these have already been mentioned. There still remain hypertrophy, atrophy and abnormal position (placenta prævia), and chorio-angioma may be associated with hydramnios.

Syphilis may produce a placenta which is large, pale, friable, infarcted and œdematous. There is an increase in fibrous stroma and an obliterative endarteritis render the villi almost avascular. Demonstration of *Treponema pallidum* is rarely possible.

8. MORBID CONDITIONS OF THE FŒTUS

Syphilis. This is not now such a common condition as it used to be, but if a woman has had syphilis and becomes pregnant, however long ago she may have had the disease and however well she may have been treated, the only way to ensure that the child shall not be infected is to give the mother anti-syphilitic treatment during each and every subsequent pregnancy.

When a fœtus is syphilitic its fate depends upon the degree to which it is affected. Some are born dead and macerated and show obvious signs of the disease; some are born alive, but marked by the disease; some are apparently healthy at birth, but show signs of syphilis later.

9. DEATH OF THE FŒTUS

Fœtal death may be caused by placental atrophy or separation, rarely by knots in the cord, or be the result of some malformation such as anencephaly. More usually it is due to some maternal condition, for instance pre-eclampsia, chronic nephritis, rhesus incompatibility, diabetes mellitus and syphilis. Other maternal conditions which can lead to intra-uterine fœtal death are starvation, injury, hyperpyrexia, the exanthemata and lead poisoning.

After death, the fœtus is usually expelled within a few days, but it is occasionally retained for more than four weeks. If retained for twelve hours or more maceration begins to take place. This is an autolysis of soft tissues. The epidermis becomes raised in vesicles and peels, the subcutaneous tissues become red and œdematous, the body flaccid, the brain semi-fluid and the cranial bones separated.

Symptoms of Fœtal Death. A period of violent fœtal movement followed by cessation of all activity is suggestive. If the heart sounds had previously been heard and can now no longer be detected, the evidence of fœtal death is strong. Proof can be obtained by an X-ray photograph which will show overriding of the cranial bones (Spalding's sign), marked angulation of the spine, and possible bubbles of gas in the heart muscle and umbilical cord. Rarely lactation becomes established.

Treatment. It is wise to await spontaneous expulsion of the dead fœtus and this usually occurs within four weeks. If it does not occur the intra-amniotic injection of hypertonic glucose 200 ml. under strict aseptic conditions will induce labour. Others will prefer to use continuous intravenous oxytocin drip.

10. ERYTHROBLASTOSIS

In Great Britain 83 per cent. of the population contain in their red blood cells an antigen called the rhesus factor. These persons are spoken of as rhesus positive. The remaining 17 per cent. are without this factor and are said to be rhesus negative. If a rhesus negative woman becomes pregnant by a rhesus positive man her fœtus will in most cases be rhesus positive. It is estimated that in one pregnancy in every ten there is a rhesus positive baby in a rhesus negative mother. In these cases fœtal red blood cells may pass through the placenta into the mother's blood stream and thus to the reticulo-endothelial system where they may give rise to rhesus antibody formation. These rhesus antibodies may then pass back through the placenta into the fœtal circulation, where they may become attached to the fœtal red blood cells which will then be destroyed because they contain the offending antigen. Extreme destruction of the fœtal red blood cells is followed by extreme abnormal red blood cell production within the fœtus. The combination of gross anæmia in so far as normal red blood cells are concerned together with the presence of abnormal red cells constitutes erythroblastosis. If the condition is mild the baby will be born anæmic—hæmolytic anæmia of the newborn. If the condition is moderately severe the baby becomes severely anæmic after birth and the destruction of red blood cells leads to jaundice—icterus gravis neonatorum. If the baby is profoundly affected the serous cavities are distended with fluid, there is severe anæmia, gross œdema, and it does not survive long after birth—hydrops fœtalis. More severely affected babies will die before birth and this will lead to a macerated fœtus.

It is the natural history of the disease that each affected baby is more severely affected than its predecessor. The first baby is rarely affected, the second is usually slightly affected and the third baby usually requires treatment to ensure its survival.

Antenatal Care. In addition to a careful obstetric history the mother's blood will be tested during her pregnancy at twelve weeks and thirty-two weeks for the presence of rhesus antibodies. If these are found further tests are made at two-weekly intervals to detect any increase in antibody titre. It is now the usual custom to remove the baby from the adverse environment of the uterus in most cases where a moderately severely affected baby is anticipated. Surgical induction of labour or Cæsarean section is indicated where there has been a previously affected baby, where there is an antibody titre in excess of 1 : 32, in the presence of hydramnios, where there is radiographic evidence of hydrops fœtalis, or when examination of the liquor amnii suggests a severely affected fœtus.

Treatment of the Baby. Immediately following delivery a specimen of cord blood is examined. A positive direct

Coombs reaction indicates that the baby is affected and that there are rhesus antibodies attached to the fœtal red blood cells. A hæmoglobin of less than 100 per cent. indicates that the baby is severely affected and should receive an exchange transfusion. A bilirubin of more than 3·0 mg. per cent. also indicates severity.

A polythene tube is inserted into the umbilical vein. Ten ml. of the baby's blood is withdrawn and replaced by 9 ml. of compatible rhesus negative blood. A total exchange of approximately 400 ml. is performed and this effects over a 90 per cent. exchange of fœtal red blood cells.

Subsequently, the baby's blood is examined for a rise in the level of bilirubin and if this exceeds 18 mg. per cent. a further exchange transfusion will then be done to prevent the baby developing kernicterus. This is a staining of the brain nuclei with non-conjugated bilirubin and subsequent loss of neurones and gliosis. This results in bilateral athetosis and neurological signs.

B. Accidental Complications of Pregnancy

I. ACUTE INFECTION FEVERS

Influenza, particularly during severe epidemics such as the one in 1918, is a grave complication of pregnancy, and carries a great risk of abortion and even of maternal death.

Erysipelas is an acute streptococcal infection not often seen at the present time.

Smallpox and Typhoid Fever, are rare diseases nowadays. When they do attack a pregnant woman, they are extremely serious matters for both mother and child.

Measles and Scarlet Fever, if mild, have no influence on pregnancy. If severe, they are liable to cause abortion.

Rubella (*German Measles*) is a mild disease so far as its general effects are concerned. But a woman affected with rubella at about the sixth to the fourteenth weeks of pregnancy is frequently delivered subsequently of a baby showing some abnormality, such as congenital blindness, congenital deafness and cardiac septal defects. The risk of serious congenital malformation may be as high as 25 per cent. and many obstetricians now recommend termination of pregnancy before the twelfth week. There is no conclusive proof that other virus infections cause fœtal abnormalities. Rubella contacts before the twelfth week should receive prophylactic gamma globulin 1,500 mg. intramuscularly.

2. DISORDERS OF THE RESPIRATORY SYSTEM

Asthma is very little affected by pregnancy. Attacks may be precipitated by upper respiratory infections for which antibiotics should be prescribed. Bronchial spasm is relieved by aerosol inhalations and aminophylline by mouth. ACTH and corticosteroids should be reserved for severe resistant attacks.

Acute Pneumonia during pregnancy may be fatal to the mother. Abortion is frequent. Presumably this is consequent upon fœtal death due to asphyxia or to the maternal hyperpyrexia. Treatment is with oxygen and antibiotics.

Pulmonary Collapse. There is usually a delay in the emptying of the stomach during labour and a tendency to hiatus hernia in pregnancy. This may result in regurgitation of stomach contents during anæsthetic induction, with the inhalation of acid fluid and gross particulate matter into the bronchial tree. The combination of bronchial spasm and mechanical obstruction results in pulmonary collapse and infection. Bronchoscopy may be necessary. Enthusiastic postural drainage may help to clear the obstruction. Antibiotics are given immediately.

Pulmonary Tuberculosis. It is now customary to take a routine chest X-ray of every pregnant patient to exclude acute pulmonary tuberculosis. Provided full treatment is given for the disease, pregnancy does not appear to have an adverse effect. There is a risk of recrudescence during the puerperium and it is best to advise against pregnancy until the disease has been quiescent for two years. The sputum is cultured and as soon as tubercle bacilli have been isolated, treatment is begun with combined drug therapy—streptomycin 1 g. daily by injection, isoniazid 100 mg. three times daily and sodium PAS 5 g. twice daily. Chemotherapy in reduced dosage is continued for one year. In addition, bed rest and adequate diet are desirable. Collapse therapy is now seldom required. Pneumoperitoneum is contra-indicated because of the risk of intra-uterine injection. The second stage of labour should be short and low forceps extraction under pudendal block is often preferred. Lactation is forbidden. The baby should receive B.C.G. vaccination and should be segregated from its mother until the tuberculin test becomes positive.

3. DISORDERS OF THE CIRCULATORY SYSTEM

Circulatory Adjustments during Normal Pregnancy. During the last three months of pregnancy there is an increase in cardiac output, which is brought about by an increase in stroke volume and a tachycardia. There is an increase in circulating blood volume and this contributes towards an increase in venous return to the heart. The placenta constitutes an area of low vascular resistance and its effect has been likened to an arterio-venous fistula. These changes throw an added burden on the maternal heart which, if previously diseased, may show evidence of failure. In addition, physical signs and symptoms appear, which may suggest the presence of organic heart disease although none is present.

Physical Signs in Normal Pregnancy. Vascular dilatation may produce capillary pulsation, increased pulse pressure, a forceful cardiac impulse with systolic ejection murmurs and accentuation of a normal third heart sound. Minor changes in the electrocardiogram occur from cardiac rotation. Postural hypotension may occur late in pregnancy from compression of the inferior vena cava by the enlarging uterus. Paroxysmal tachycardia is not uncommon, but may be associated with an underlying cardiac lesion.

Heart Disease

The heart murmurs indicative of organic cardiac disease are accentuated in pregnancy and this aids diagnosis. All diastolic cardiac murmurs, cardiac enlargement and atrial fibrillation should be considered as indicative of cardiac disease. Pregnancy can be expected to have an adverse effect on the functional efficiency of the heart and in addition the presence of anæmia, upper respiratory infections, pre-eclamptic toxæmia, cardiac arrhythmias, recrudescence of rheumatic fever, bacterial endocarditis and hyperthyroidism may each be sufficient to precipitate cardiac failure.

Although there has been a marked decrease in the incidence of rheumatic fever during the last ten years, the commonest cardiac disease encountered in pregnancy is still mitral stenosis. Many of these patients will go through pregnancy safely and have a quick and easy confinement. Others, however, with advanced disease or with complications may go into cardiac failure during their pregnancy. This risk can be minimized by avoiding excessive weight gain, by restricting salt intake, by giving digitalis to all patients with some degree of decompensation present in early pregnancy, by ensuring adequate domestic help, and frequent periods of complete bed rest.

Termination of pregnancy is sometimes indicated where there is a history of previous cardiac failure, gross cardiac enlargement, atrial fibrillation or recent acute rheumatic fever.

Antepartum mitral valvotomy may be indicated in patients with episodes of acute pulmonary œdema. Good results from this operation can be anticipated if the heart is small, the rhythm is regular, the electrocardiogram shows right ventricular dominance and the lesion is mainly mitral stenosis.

During labour the sitting position is preferred. Oxygen may help the dyspnœic patient. The second stage is hastened by episiotomy under local anæsthetic, or if prolonged more than ten minutes an easy forceps delivery under pudendal block with the patient in a semi-reclining position will reduce the risks of failure. Acute pulmonary œdema occurring in labour is relieved by morphine, venesection and the slow intravenous injection of 0·5 g. of aminophylline, which relieves the accompanying bronchial spasm. Antibiotic cover during delivery is seldom necessary and is not recommended. Surgical induction of labour and Cæsarean section are best avoided. If sterilization is considered necessary, the operation should be postponed until the cardiac output has returned to normal. If breast feeding appears to be easy it should not be discouraged in mild cases.

Congenital Heart Disease. The patient with congenital heart disease who survives infancy, marries and becomes pregnant is not usually severely affected. Unlike rheumatic heart disease there is no myocarditis. Pregnancy and confinement in these cases does not present any real problem.

Hyperthyroidism. This rarely causes heart disease in women of child-bearing age.

Essential Hypertension in Pregnancy. There is often a strong family history of high blood pressure. It is very important that other causes of high blood pressure, including renal disease and coarctation of the aorta, are excluded before a diagnosis of essential hypertension is made. Provided the condition is not severe, i.e. blood pressure less than 160/100, the mother comes to little harm, but even mild hypertension reduces the effective blood flow through the uterus and placental site, and this constitutes a severe threat to the baby. About two-thirds of the patients who start their pregnancy with essential hypertension have a further increase of pressure sometime after the sixth month. Half of these will also develop albuminuria and the signs of a superimposed pre-eclampsia. The complications of pre-eclampsia, including accidental antepartum hæmorrhage and fœtal death *in utero*, are much increased.

If the blood pressure is 180/100 or more at the beginning of pregnancy and is associated with albuminuria, cardiac enlargement and retinal changes, the pregnancy should be terminated. There is little chance of a live baby and pregnancy may endanger the mother's life. Less severe cases will require frequent admissions to hospital for bed rest. Many will benefit from hypotensive drugs such as Serpasil 0·25 mg. twice daily until about two weeks before delivery when the drug should be stopped. Premature delivery following surgical induction at 37 weeks or, if this fails, Cæsarean section will increase the chances of fœtal survival.

Coarctation of the Aorta. These patients may suffer death from rupture of the aorta, bacterial endocarditis, or the rupture of dissecting aneurysm. Pregnancy appears to increase this risk. Many obstetricians advise Cæsarean section in order to eliminate the physical exertion of labour.

Varicose Veins and Piles

The pressure of the enlarging uterus on the pelvic veins and the hormonal changes of pregnancy cause an increase in the peripheral venous pressure and a dilatation of the veins. Varicose veins of the vulva form a great disability during pregnancy, and can be treated only by rest with the pelvis raised. During labour they may be a serious difficulty, and may rupture. The hæmorrhage must then be stopped by pressure.

Varicose veins of the legs should be given support from a good fitting elastic stocking. Raising the foot of the bed will relieve symptoms at night. Surgery is best avoided in pregnancy. Varicose ulcers are very rarely seen in pregnancy.

4. DISORDERS OF THE RENAL TRACT

Renal Changes in Normal Pregnancy. There is an increase in renal blood flow and glomerular filtration rate. There is a diminished breakdown of body protein and these changes produce a low blood urea of 20 mg. per 100 ml. and a high van Slyke urea clearance test. The renal pelvis and ureters undergo dilatation from the effects of the pregnancy hormones on the ureteric muscle and from pressure of the uterus and fœtus against the pelvic brim.

Postural Albuminuria. This may occur in pregnancy and may be due to compression of the inferior vena cava. With bed rest the albuminura disappears. There are no granular casts in the urine and the condition is harmless.

Acute Nephritis. This is rare in pregnancy. There is generalized œdema, hypertension, macroscopic hæmaturia, albuminuria and granular casts in the urine. Bed rest and penicillin are given.

Neophrotic Nephritis. This is rare in pregnancy. The heavy albuminuria leads to protein loss and severe generalized œdema. A high protein diet is given. Sodium excretion may be increased by giving cation exchange resin.

Chronic Nephritis. This may follow acute nephritis. There is albuminuria and urinary casts. If the blood pressure is normal the outlook in pregnancy is good. If hypertension has already developed the prognosis is poor. Many pregnancies will abort and half of the babies will be lost. The renal condition may be found to deteriorate. Such deterioration is evidenced by a rising blood pressure and blood urea content; by a fall in the power to excrete urea—the urea concentration test; by diminished excretion of urine and an increase in the amount of albumin; or by the occurrence of albuminuric retinitis. Once such a deterioration is definitely shown, and providing it continues despite treatment, the pregnancy must be terminated irrespective of the duration of the gestation. Surgical induction or Cæsarean section before term is usually necessary.

Polycystic Kidney. This is rare in pregnancy. A married woman known to have a polycystic kidney should have her children as soon as possible, since the condition usually progresses towards renal failure before the age of 50 years.

Pyelonephritis of Pregnancy. This occurs in about 1 per cent. of all pregnancies. The dilatation of the renal tract and the high incidence of urinary infection introduced via the urethra are mainly responsible. The causative organism is usually *Escherichia coli* but may be staphylococcus aureus or *Bacillus proteus*. It often occurs at about the twentieth week. The usual manifestation of the infection is an acute attack of pain in, usually, the right iliac fossa and right loin, together with malaise, frequent and painful micturition, a rise of temperature often to 39° or 40°C (102° or 104°F), and vomiting. Appendicitis is simulated, particularly as the right rectus may be in spasm. The points in the differential diagnosis are that, in pyelitis, the temperature tends to be higher, there is tenderness posteriorly in the costo-vertebral angle, and the urinary examination. This should be performed on a catheter specimen, which, on microscopic examination, will show pus cells, red blood cells and motile rod-like organisms in a single uncentrifuged drop; on culture *E. coli* will be grown, and it is helpful if the pathologist will indicate to which of the sulpha drugs or antibiotics the organism found is sensitive. The above description applies to the more common right-sided and acute attack. Sometimes, however, the attack is bilateral, or on the left side. Less acute and less severe forms of the disease also occur. Although the condition is usually referred to as "pyelitis", in addition to the pelvis of the kidney, the ureter and the bladder are commonly affected, and some degree of pyelonephritis commonly coexists. Treatment consists of bed rest, copious fluids, sulphadimidine 1 g. every six hours, and mixture of potassium citrate B.P.C. 1 fl. oz. every six hours. *B. proteus* is treated with nitrofurantoin (Furadantin) 100 mg. four times daily. Treatment is continued for three weeks and a small prophylactic dose of sulphonamide may be necessary to prevent relapse.

Acute Renal Failure. This may complicate concealed accidental hæmorrhage, eclampsia, severe postpartum hæmorrhage, infection by hæmolysing organisms such as *Clostridium perfringens* (*welchii*) and incompatible blood transfusion.

There is a marked arterial constriction of the vessels supplying the renal cortex, which in severe cases may suffer irreversible necrosis leading to death from renal failure. The onset is sudden with profound oliguria. There is a rise in blood urea, potassium, sulphate and phosphate and a fall in serum calcium with a resulting metabolic acidosis. This oliguric phase may persist three to twenty days and during this time the patient receives a protein-free diet of glucose 100 g. in 600 ml. of water through a thin polythene stomach tube. If this causes vomiting it may be necessary to give the glucose solution into the inferior vena cava.

If the kidney recovers the oliguria is followed by diuresis. During this diurectic phase the renal tubules cannot reabsorb potassium, chloride or sodium and this may lead to a serious depletion of blood electrolytes. During this phase fluids are given liberally by mouth but no food until the blood urea has fallen consistently for three days.

5. DISORDERS OF THE ALIMENTARY TRACT AND LIVER

Changes in Normal Pregnancy. The general lack of tone and motility of non-striated muscle also affects the alimentary tract. There is a fall of intragastric pressure, but also a tendency for gastric contents to regurgitate into the œsophagus, causing heartburn, made worse by stooping. Constipation is often troublesome and may in part be due to diminished peristalsis. There is fall in acid gastric secretion and this may explain the relief of symptoms of peptic ulcer during pregnancy.

Appendicitis. During pregnancy the appendix and cæcum are elevated by the enlarging uterus and this may render the diagnosis of acute appendicitis more difficult. The uterus restricts the protective influence of the omentum and the raised level of circulating adrenocorticoids reduces the protective inflammatory reaction when appendicitis supervenes. The more advanced the pregnancy, the more serious the appendicitis becomes. In early pregnancy there will be central abdominal pain and localized tenderness, nausea, vomiting and mild pyrexia. As the pregnancy advances so the tenderness will be less localized and the diagnosis more difficult. Dehydration is corrected, antibiotics given and the appendix removed without delay. The pregnancy should be allowed to continue and Cæsarean section will always increase maternal morbidity.

Ulcerative Colitis. This is commonly seen in pregnancy, which tends to aggravate the condition and may precipitate an attack. Treatment with adrenocorticotrophic hormone (ACTH), adrenal steroids, blood transfusion and a high calorie diet rich in vitamins is recommended.

Acute Fatty Liver of Pregnancy. The cause of this condition is unknown. The liver function tests do not suggest a virus infection. The onset is in the last six weeks of pregnancy when there is increasing epigastric pain, vomiting, jaundice, headache and fever. The fœtus usually dies *in utero*. The mother usually dies and autopsy reveals a central fatty degeneration of the liver lobules without necrosis.

Viral Hepatitis. The onset of the infection is slow. There is malaise, anorexia and pyrexia. After a few days the patient feels better, but develops jaundice due to intrahepatic bile duct obstruction. The stools are pale and the urine dark. Liver function tests confirm the diagnosis. In severe cases the condition may progress to a fatal central lobule hepatic necrosis, described in the old obstetric textbooks as acute yellow atrophy. A low fat diet, rich in protein, carbohydrate and vitamins is given. The formation of prothrombin is depressed and there is always a danger of postpartum hæmorrhage. Vitamin K_1 by injection will encourage the liver to counteract this deficiency.

6. DISORDERS OF THE BLOOD

Anæmia

This may cause listlessness, headaches, giddiness, palpitations and anorexia. Resistance to infection is decreased. The commonest cause is an iron deficiency which produces a hypochromic, microcytic anæmia. Ferrous gluconate 5 grains four times daily can be given by mouth. If this causes severe nausea then saccharated iron oxide can be given intravenously.

Megaloblastic anæmia of pregnancy is caused by a deficiency of folic acid, which is necessary for the normal synthesis of nucleic acid. In addition to the usual symptoms of anæmia there is often soreness of the tongue and splenic enlargement. The anæmia is often severe and the mean corpuscular volume (M.C.V.) is raised above 100 μ^3. Folic acid 10 mg. three times daily by mouth produces a reticulocyte response.

Sickle Cell Anæmia. The condition is confined to negroes. The red cells contain an abnormal hæmoglobin which at low oxygen tensions crystallizes out of solution and causes the characteristic sickle-shaped red cells and hæmolysis. The condition is diagnosed by electrophoresis. Severe hæmolytic crises may develop in pregnancy with death of both baby and mother.

Hypofibrinogenæmia. This condition may complicate accidental antepartum hæmorrhage, prolonged death *in utero* and incompatible blood transfusion. The exact mechanism of the fibrinogen deficiency remains obscure. It may cause purpura before delivery and a persistent postpartum hæmorrhage after the expulsion of the placenta. In most instances following delivery the fibrinogen level rises spontaneously and the bleeding ceases. If the fibrinogen level in the blood remains below 100 mg. per 100 ml. then it may be necessary to give fibrinogen 4 g. in 400 ml. of water by slow intravenous infusion.

Venous Thrombosis

Following delivery there is an increase in the blood platelets and fibrinogen. Throughout pregnancy there is a progressive slowing of venous blood flow in the legs. During delivery there may be hæmoconcentration from dehydration and trauma. In the puerperium there may be infection and anæmia. All these factors predispose to venous thrombosis.

Thrombophlebitis in a varicose vein gives rise to a tender swelling localized to the vein. A firm crepe bandage and antibiotics afford rapid relief from pain. Within a few days the leg is bandaged with "Elastoplast" and the patient allowed up.

Phlebothrombosis occurs in the pelvic veins and the deep veins of the leg muscles. There may be few physical signs in the leg and diagnosis may only be made after the patient has suffered a pulmonary embolism. In other cases there will be pain and tenderness in the calf, which is increased by dorsiflexion of the foot. The foot feels cold because of arterial spasm. There is always the risk of fatal pulmonary embolism and these patients are best treated with anticoagulants. Intravenous heparin 100 mg. is given every four hours for six doses and this relieves the arterial spasm and pain. At the same time phenindione (Dindevan) 200 mg. is given by mouth. A further dose of 150 mg. is given twelve hours later and, thereafter, the dose is regulated by daily prothrombin times. Should abnormal bleeding develop the Dindevan is withheld and vitamin K_1 50 mg. is given by mouth. Venous ligation and paravertebral block of the lumbar sympathetic chain is now seldom employed.

Pulmonary embolism is a relatively common event. In most instances the embolism is small and causes no infarction. There may be transient fainting and tachycardia of short duration and the episode may go unnoticed. Larger emboli will cause more marked symptoms and after about six hours an infarction develops with pleuritic pain and hæmoptysis. X-ray will often reveal an opacity in the lung field, commonly the right lower lobe.

A massive pulmonary embolus may cause partial obstruction in the bifurcation of the pulmonary artery. The pressure behind the obstruction rises, the right ventricle dilates and then fails. The neck veins are dilated, the liver is enlarged and tender, and gallop rhythm may be heard at the lower end of the sternum. The reduced output from the left ventricle results in a fall of blood pressure and coronary ischæmia. There is sudden collapse with marked dyspnœa and cyanosis. The electrocardiogram may show characteristic changes. Many patients die immediately or within the hour. Intravenous heparin is given without delay and this may help to prevent a further fatal embolus. Morphine is valuable and will help to relieve pain, anxiety and restlessness.

7. DISORDERS OF METABOLISM

Glycosuria

Lactose very rarely appears in the urine during pregnancy and a positive Benedict's reaction usually indicates glucosuria, which should always be investigated by a glucose tolerance test. In most instances the cause is a low renal threshold for glucose and this may occur for the first time in pregnancy. No treatment is required and the fœtus is not endangered.

Diabetes Mellitus

Diabetes mellitus occurs in one pregnancy in 500. The increase in maternal corticosteroids usually leads to an increase in the mother's insulin requirements. The renal threshold falls and thus the level of urinary glocuse is no longer a satisfactory indication of the level of blood glucose. Frequent blood sugars are essential to effect good control. During delivery it is usually necessary to give four doses of soluble insulin during each 24 hours and if the calorie intake by mouth is unreliable there should be no hesitation in giving a continuous intravenous glucose infusion. There is an increased risk of pre-eclampsia, hydramnios, and the glycosuria may encourage a monilial vaginitis.

The fœtal risk from diabetes mellitus is high. Abortion is common. The infant is markedly œdematous and, although the birth weight is high, it shows many of the characteristics of a premature baby. Cyanotic attacks are common and many develop a fatal pulmonary syndrome with hyaline membrane formation and atelectasis.

Unfortunately many infants die *in utero* before term is reached. It is now common practice to deliver at thirty-six weeks either by surgical induction and normal delivery in the multigravid or by elective lower segment Cæsarean section in the primigravid. Even with the best possible care it is estimated that about 20 per cent. of the babies are lost.

Hyperthyroidism

Severe hyperthyroidism is rarely associated with pregnancy. Milder cases tolerate pregnancy well and usually only require mild sedation with phenobarbitone. If antithyroid drugs such as prophyl thiouracil are used the dose should be kept as low as possible. Large dosage may cause thyroxine deficiency in the fœtus and impair normal brain development. Partial thyroidectomy is seldom necessary and radioactive iodine should not be used.

Corticosteroid Therapy during Pregnancy

Many patients who are receiving ACTH or adrenal steroids for a variety of conditions now become pregnant. Treatment with corticosteroids should not be stopped abruptly or acute adrenal failure may develop. Labour and surgical trauma may precipitate failure but this can be prevented by giving cortisone 100 mg. twice daily by injection during labour and in gradual reduced dosage for a further four days.

8. DISORDERS OF THE NERVOUS SYSTEM

Subarachnoid Hæmorrhage

This usually results from the rupture of a congenital aneurysm of the circle of Willis. There is sudden onset of severe headache, vomiting, convulsions and possibly coma. There is neck rigidity and a variety of neurological signs. The cerebrospinal fluid (C.S.F.) is heavily bloodstained. Morphine is given for 48 hours and then cerebral angiography is performed with a view to surgical treatment.

Idiopathic Epilepsy

This occurs in 0·5 per cent. of the population. Pregnancy has little effect and there is no contra-indication to drug therapy with phenobarbitone and phenytoin. The diuretic, chlorothiazide, should be given if there is any tendency to fluid retention, which may precipitate convulsions. The signs of toxæmia are absent and the condition should not be confused with eclampsia.

Chorea Gravidarum

This is the same as Sydenham's rheumatic chorea. Most patients will have suffered previously from chorea or rheumatic fever. There is an active endocarditis and degenerative changes in the basal ganglia. Typical choreic movements may be accompanied by pyrexia in severe cases. Bed rest and sedatives are indicated.

Maternal Obstetric Paralysis

This may result from pressure on the lumbo-sacral trunk by the fœtal trunk or from a prolapsed intervertebral disc. During or soon after labour the patient complains of pain in the back of the leg and weakness of the dorsiflexors of the foot. Sensory loss is slight. The signs of a lower motor neurone lesion may develop and recovery may be slow.

Acroparæsthesiæ

The retention of fluid during pregnancy, together with a mild tenosynovitis of the flexor sheath may cause pressure on the median nerve as it passes beneath the flexor retinaculum of the wrist. There are paræsthesiæ and pain in the hand and a feeling of stiffness in the fingers. The condition usually occurs towards the end of pregnancy and symptoms are worse at night. Diuretics and elevation of the arm on a pillow may provide temporary relief. In severe cases an injection of hydrocortisone is often helpful.

9. DISORDERS OF THE GENITAL TRACT

Leucorrhœa

An excess of normal cervical secretion is common in pregnancy and is associated with the increased size and vasularity of the cervix. No treatment is necessary beyond normal cleanliness.

Monilial Vaginitis

This is caused by a yeast-like organism, *Candida albicans*. It produces a thick, white discharge which adheres to the vaginal mucosa.

Glycosuria from any cause renders the vagina more susceptible. Nystatin or Mycil pessaries two each night for two weeks will usually effect control.

Trichomonas Vaginalis

This is a parasitic infection, which causes a profuse vaginal discharge which is green-yellow, offensive and highly irritating. The discharge is creamy in consistency and may contain little bubbles of gas. Treatment with acetarsol pessaries two each night for three weeks is often effective. As an alternative Flagyl tablets one three times daily by mouth will cure the condition.

Gonorrhœa

Gonorrhœa is again becoming more common. The infection may be transferred to the baby during delivery and cause a gonococcal ophthalmia. Both the mother and baby should receive penicillin. On rare occasions the infection may cause an acute salpingitis in early pregnancy. The gonococcus does not cause puerperal sepsis.

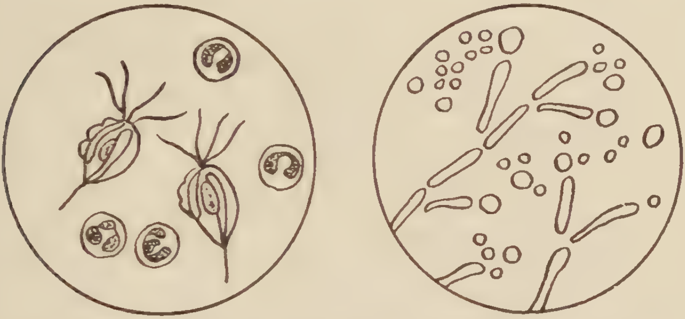


FIG. 17. Microscopical Appearance of: *A*, *Trichomonas vaginalis* and pus cells; and *B*, mycelial threads and spores of *Candida albicans*.

Carcinoma of the Cervix

Early carcinoma of the cervix does not prevent conception. In early pregnancy the uterus is emptied by hysterotomy and radium treatment begun ten days later under antibiotic cover. In advanced pregnancy a classical Cæsarean section is performed, infection prevented with antibiotics and radium treatment begun ten days later. When the carcinoma is confined to the cervix some obstetricians will prefer to perform Wertheim's extended hysterectomy rather than use radium.

Ovarian Cysts

If an ovarian cyst is discovered in early pregnancy, an ovarian cystectomy with preservation of ovarian tissue is carried out at sixteen to eighteen weeks. There is then little risk of abortion.

If the discovery is made late in pregnancy it may be possible to push the cyst above the fœtal head and allow vaginal delivery to take place. The cyst is removed early in the puerperium.

If the cyst remains below the fœtal head in labour, the infant is delivered by lower segment Cæsarean section. The uterus is sutured and the cyst then removed.

In no circumstances should the cyst be tapped and the fœtal head should not be dragged past the obstruction with obstetric forceps.

Uterine Fibroids

These are very commonly found in association with pregnancy, and the great majority cause no trouble either during the period of gestation or in labour. They merely appear as hard and perhaps slightly tender bosses on the surface of the uterus.

During pregnancy a fibroid may undergo red degeneration. It becomes the site of severe pain, is tender to the touch, and causes considerable elevation of temperature and perhaps vomiting. The treatment is at first palliative by rest in bed and morphine. If the symptoms fail to settle under this régime then it may on rare occasions be necessary to enucleate the affected fibroid (myomectomy), and in a surprisingly large percentage of cases the pregnancy continues undisturbed. Nevertheless, it is an operation to be avoided if possible.

In other cases a fibroid may appear to be the cause of infertility or miscarriage and in either event surgical treatment is indicated.

During labour a fibroid in the lower segment or in the cervix may occasionally remain below the presenting part and cause obstruction. The treatment is Cæsarean section followed at a later date by removal either of the fibroid or of the uterus. Usually those cases in which a fibroid, growing low down in the uterus, would seem likely to obstruct labour are found to deliver themselves perfectly easily. It is remarkable how such fibroids become pulled up above the presenting part towards the end of pregnancy, and especially in the first stage of labour, so that, the obstruction removed, labour is able to proceed normally.

There are two other ways in which fibroids can complicate labour. They may cause a malpresentation, and they may lead to postpartum hæmorrhage. This latter may be due to the interference with full retraction or to a placenta morbidly adherent over the site of a fibroid.

C. Disorders Dependent upon Pregnancy

I. DISPLACEMENTS OF THE GRAVID UTERUS

Retroversion

Although anteversion is described as the normal uterine position, a large proportion of healthy young women have a retroversion. When such a woman becomes pregnant she is described as having a retroverted gravid uterus. In the great majority of these cases the condition spontaneously rectifies itself at about the twelfth week, the body of the uterus slipping up past the promontory of the sacrum and rising into the abdomen.

In others the uterus fails to rise up, perhaps because it is held down by an overhanging sacral promontory as in the case of a flat pelvis. It then becomes an incarcerated retroverted gravid uterus. Symptoms do not arise until about the fourteenth week when the pelvic cavity is filled. The bladder is, therefore, pushed up into the abdomen and the urethra greatly elongated. This leads to retention of urine, with, subsequently, overflow. The patient then complains that she cannot pass her urine naturally, but that, instead, it runs away from her.

There is a soft elastic swelling found rising out of the pelvis to about the umbilicus and this is the distended bladder. The three months' uterus is felt on vaginal examination to be filling the greater part of the pelvis. The cervix is high up and in front, near the top of the symphysis pubis.

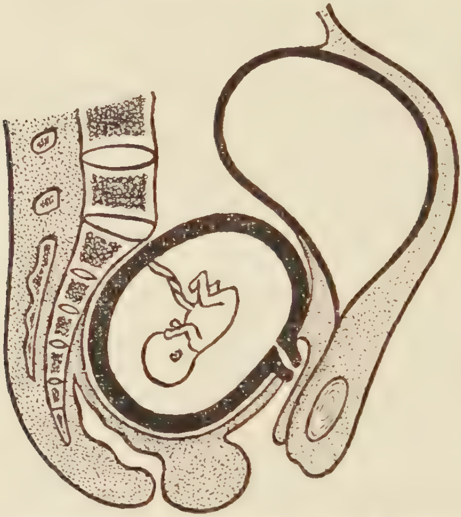


FIG. 18. Retroversion of the Gravid Uterus with Retention of Urine.

Treatment. A soft rubber or plastic catheter is passed and the bladder emptied. In rare cases it may be necessary to tap the bladder through the anterior abdominal wall. Continuous open bladder drainage is maintained for 36 hours during which time the patient lies in a semi-prone position. In most instances the retroversion corrects itself, but if this fails manipulation is necessary. Gentle digital pressure is applied to the fundus through the posterior fornix of the vagina. The reposition may be facilitated by having the woman in the knee-chest position, or the Trendelenburg position. Sometimes an anæsthetic is required. If digital reposition fails, replacement may sometimes be secured by means of continuous pressure from a ring pessary placed in the vagina.

It is extremely rare for such treatment to fail since, manifestly, a uterus bound down by adhesions and so impossible of replacement, is likely to have its uterine tubes also involved in the adhesions. In such a case pregnancy is rare.

When the uterine malposition has been corrected, a ring pessary large enough to hold the uterus up above the pelvic brim should be fitted and worn until the eighteenth week. The uterus will then be much too big to fall back again.

Pendulous Abdomen

This occurs when the pregnant uterus passes between the divaricated recti muscles, and so lies underneath the skin of the abdominal wall. It is most likely to occur after many pregnancies. The abdomen should be supported by a well-fitting maternity corset.

Uterine Prolapse

As the uterus enlarges to above the pelvis it is prevented from descending down the vaginal canal. In most instances the symptoms of uterine prolapse are relieved in pregnancy. Occasionally the uterus may fail to rise up into the abdomen and become incarcerated in the pelvic cavity. If not pushed up and retained in position by a ring pessary, abortion will occur.

Stress Incontinence

Stretching of the vaginal walls during a previous pregnancy may cause an incompetent bladder sphincter and stress incontinence. A further pregnancy tends to aggravate the symptoms. Some relief may be gained by inserting a Hodge pessary back to front, so that the prominent ridge presses on the bladder neck.

Pernicious Vomiting or Hyperemesis Gravidarum

This is an exaggeration of the common morning sickness, and may be defined as vomiting of such severity as adversely to affect the patient's health. The cause is probably a hypersensitivity of the vomiting centre to the rise in œstrogen level during early pregnancy. When vomiting is sufficiently severe as to cause electrolyte disturbances there is probably a neurotic factor. The profound and persistent vomiting leads to dehydration, deficiency of sodium, chloride and glucose. Abnormal breakdown of body fat leads to ketosis. Later there may be albuminuria, jaundice, rising pulse rate and temperature, the appearance of blood in the vomit, coma and finally death. Such desperate cases are now rare.

Treatment. The first treatment of a case of excessive vomiting of pregnancy is removal to hospital and isolation. This alone has a most salutary effect on the mild type of case. More severe cases will require intravenous therapy. In ideal circumstances this therapy will be dependent upon daily blood electrolyte analysis. Initially glucose-saline may be given until the signs of dehydration have subsided. The sensitivity of the vomiting centre may be reduced by giving chlorpromazine (Largactil) 25 to 50 mg. by injection four times daily for three days. Thereafter, the vomiting can usually be controlled with antihistamines such as Ancolan 25 mg. by mouth three times daily. Malnutrition may have led to a deficiency of vitamin B_1 which can be given by mouth or by injection. When the vomiting subsides sweetened drinks are given by mouth. A solid carbohydrate diet can usually be started within a few days. Patients with a strong neurotic factor may respond to simple psychoanalysis, suggestion and hypnosis.

Pre-eclampsia (*Toxæmia of Pregnancy*)

This term covers those cases in which during the course of pregnancy there occur any two of the three conditions: albuminuria, œdema and hypertension of either 140 systolic or 90 diastolic or more, and in which these signs are not due to a pre-existing nephritis. Albuminuria may result from contamination by vaginal discharge or infection in the urine.

Chemical and microscopical examination of a catheter specimen of urine will exclude this. In a true case of toxæmic albuminuria the albumin appears for the first time at or after the twenty-eighth week, and will be discovered by the routine antenatal urine testing.

Clinically it is helpful to divide cases of pre-eclampsia into a large group of mild cases and a much smaller group of severe cases which are threatening at any moment to have an eclamptic fit. These two types will be considered separately.

The Mild Type. In this the patient looks and feels well, but there is perhaps a trace of albumin in the urine, a minor degree of hypertension—say, 140/90—and perhaps some œdema of the ankles. It is rare for this condition to appear before the thirty-second week, and most of the cases do not show up until the thirty-sixth week or later. Unless there is a dramatic deterioration they can almost certainly be treated conservatively for two or even three weeks without fear of eclamptic fits. The babies in these cases do not follow the normal pattern of intra-uterine growth, but are often undersized, and in fairly severe cases, particularly those with marked hypertension, intra-uterine fœtal death is apt to occur. Therefore, if such a case has been under treatment for two weeks without improvement, and providing the maturity is thirty-seven weeks or more, it is probably wise to induce premature labour in the interests of the child. It is in the patients in whom the condition starts at, say, the thirtieth week, and in whom no improvement is apparent by the thirty-third week, that difficulty arises. Is it better to allow the pregnancy to continue for four more weeks with the risk of intra-uterine fœtal death and perhaps some permanent maternal hypertension? Or is it better to do a Cæsarean section or to induce premature labour as early as this with the very considerable risk of fœtal death from prematurity? This decision is very much one for an expert.

The treatment, which is required during the two or three weeks in which conservative treatment is permissible, is simply bed rest, normal diet, ample fluids, sedation by $\frac{1}{2}$ grain phenobarbitone three times daily, salt restriction and regulation of the bowels. The salt restriction should be the nearest possible approach to a salt-free diet, and other sodium ions should also be excluded from the intake. Under this régime many cases improve rapidly, return to normal and can be allowed to go home, but they will probably require readmission because of recurrence a few weeks later. Others continue apparently unchanged and, after two weeks, induction of labour will be advisable if the child is sufficiently mature. Yet others will slowly deteriorate, and in these again, labour should be induced without delay providing that the degree of prematurity is not seemingly too dangerous.

The Severe Type. Severe cases of pre-eclampsia are often fulminating. There is a very sudden onset of hypertension, albuminuria and generalized œdema which becomes rapidly worse. The blood pressure may be 200/120 or more, the urine is scanty and loaded with albumin (500 mg. per cent. or more). When eclampsia, with its characteristic epileptiform fits, becomes imminent there is a severe frontal headache, epigastric pain, dimness of vision and spots in front of the eyes.

Treatment. Purgation by saline aperients has fallen into disfavour and most people would treat a case of severe pre-eclampsia by absolute bed rest, rigid salt restriction, heavy doses of sedatives, mild purgatives and watchfulness. There will be the occasional case when immediate eclampsia seems imminent and Cæsarean section will be justified. In most cases a period of conservative treatment as outlined above can be carried out. If, however, during the forty-eight hours or so of conservative treatment, which is all that can be permitted, deterioration should occur, induction of labour or Cæsarean section, according to the urgency of the case, is performed. If at the end of forty-eight hours no improvement has occurred, induction of labour is usually indicated. It is only in cases where marked improvement results from the conservative treatment that the pregnancy is allowed to continue if this should seem desirable on the grounds of prematurity.

In fulminating cases where treatment has failed or has not been instituted, eclampsia may supervene. On occasions the extreme shortness of the stage of pre-eclampsia has resulted in the onset of eclampsia practically unheralded.

Eclampsia

The eclamptic fit is very like the grand mal of epilepsy but there is no aura. There are, however, the tonic stage, the clonic stage and the subsequent period of mental confusion of varying degree and duration. The rigidity of the tonic stage is at first localized, frequently to the facial muscles, but rapidly becomes generalized. The initial pallor soon gives place to the dusky colour of cyanosis consequent upon spasm of the respiratory muscles. The pupils are dilated and do not react to light.

The clonic stage rapidly follows, and again the jerky movements may be local at first, but soon become general. These spasms may result in the tongue being bitten, in blood-stained froth issuing from the mouth, and in the voiding of urine and fæces. The skin becomes bathed in sweat. Respiration, jerky at first, recommences, and the fit gradually subsides after having lasted about a minute. When the fit has passed its violent stage the sufferer lapses into a state of coma of varying duration.

Termination. There is a great variation in the severity of different cases of eclampsia. Some cases have only one or two slight fits and then recover; others are very severe and terminate in death. No prognosis can be given on any one feature of the case but if a patient exhibits any two or more of the following grave features there is a risk of death. If none of these danger signals be present, the risk is much less.

1. Ten or more fits.
2. Urine becoming solid on boiling.

3. Extreme œdema.
4. Deep coma.
5. Blood pressure above 190 mm. Hg.
6. Temperature of 39°C (103°F) or higher.

Death from eclampsia may be due to inhalation of vomit, exhaustion, asphyxia, coma, cerebral hæmorrhage or hyperpyrexia; or death may be delayed some days and result from œdema of the lungs or from sepsis.

About 30 per cent. of the babies are either stillborn or die within a short time of birth. If the mother survives the eclampsia, recovery is usually complete. There may, however, be residual damage to the cardiovascular system, with progressive essential hypertension.

Treatment may be considered under several headings:

1. *Treatment of the patient when first seen.* In many cases the patient will first be seen in her own home by her general practitioner. He will have only to exclude epilepsy by the history, place a spatula wrapped in cloth between the jaws, give pethidine 100 mg., preferably by intravenous injection, and make arrangements for the transfer of the patient to hospital. If the hospital has a "flying squad" this organization should take control of the transfer and further sedation.

2. *Nursing.* The patient should be in a darkened room, and noise and light stimuli avoided. It is advisable for all in attendance to wear rubber-soled shoes. Avoid all unnecessary interference. The patient should lie on her side, without a pillow, so as to let the saliva run out of her mouth. After a time she should be rolled over on to her other side, so as to minimize the danger of œdema of the lungs and pressure sores of the skin. A mouth gag must be ready for insertion between the molar teeth. Care must be taken to avoid burning an unconscious patient with a hot-water bottle. Warmth is best provided by an electrically heated cradle. A catheter is inserted into the bladder and released every two hours.

3. *Symptomatic.* For Restlessness. The intramuscular injection of paraldehyde 10 ml. provides sleep and is an excellent

anticonvulsant. The injection should be repeated after four hours and should be given deep into the muscle of the leg since superficial injections may cause cellulitis of the skin.

Instead the rectal instillation of tribromoethanol has recently become deservedly popular. The dose is approximately 0·09 ml. per kilogram of body weight and this is diluted 1 in 40 with warm water. The solution must be proved free from hydrobromic acid by the Congo Red test.

More recently great success has been achieved with the "lytic cocktail" which consists of pethidine 100 mg., phenergan 25 mg. and chlorpromazine 25 mg. All three drugs are given together and repeated every two to four hours.

It has been traditional to give morphine and chloral hydrate but these are not good anticonvulsants and morphine tends to depress the respiratory system of both the mother and baby. If fits become very frequent they may be brought under control by the repeated intravenous injection of small doses of thiopentone given by an anæsthetist.

For cyanosis give oxygen inhalations, preferably with a B.L.B. mask.

For High Blood Pressure. Veratrone hypodermically, starting with 0·25 ml. when the blood pressure exceeds 160 mm. has been found helpful. The intravenous injection of 50 per cent. hypertonic glucose reduces cerebral œdema and hypertension and helps to reduce the frequency of convulsions. Venous congestion and cardiac failure may be relieved by venesection and digitalis.

For Œdema of the Lungs. Atropine may be helpful. All eclamptics should receive penicillin and streptomycin and this will reduce the risk of infection of the lungs, birth canal and urine.

4. *Obstetric.* Cæsarean section and induction of labour are used as prophylactic measures in cases of imminent eclampsia. Once fits have started immediate Cæsarean section is not favoured. When the fits have been brought under control by

heavy sedation for 24 to 48 hours then delivery is effected either by Cæsarean section or by surgical induction and forceps delivery at full dilatation under general anæsthesia. Violent methods of delivery are never undertaken nowadays.

5. *After-treatment.* Water and glucose should be given freely. The bowels should be kept open. The patient should not suckle her child, and her diet should be cautiously increased.

Pathological Findings. In the kidney, capillary thrombosis and hæmorrhage is seen and particularly in the medulla. The cortex may appear rather pale and microscopically will be seen thickening of the glomerular epithelium and relatively avascular capillary tufts. Degenerative changes are visible in the tubal epithelium, perhaps with the formation of casts. In the liver, there are focal necrosis and hæmorrhagic areas. In the brain, in addition to œdema, hæmorrhages may have occurred.

2. EXTRA-UTERINE GESTATION

Definition. Implantation and development of an ovum at some point external to the uterine cavity.

The common extra-uterine or "ectopic" pregnancy occurs in the outer portion or ampulla of the uterine tube. Less commonly pregnancy may occur in the narrow isthmus or in the interstitial part of the uterine tube (cornual pregnancy). Rarely implantation occurs in the rudimentary horn of a double uterus.

Ætiology. Infection of the uterine tube (salpingitis) may result in adhesions within the lumen and partial occlusion. When the inflammatory process has subsided a fertilized ovum may become arrested during its descent along the tube. Once the protective zona pellucida of the ovum has fragmented the underlying trophoblast erodes the wall of the tube. The delay of the ovum may on occasions be due to congenital defects of the uterine tube or migration of the ovum from the contralateral ovary across the peritoneal cavity.

Subsequent Progress. The ovum burrows into the wall of the tube in much the same way as it should have done into the uterine lining, but in the tube there is no true decidua. In consequence the ovum erodes through the thin mucosa and the muscularis of the tube. Sooner or later relatively large blood vessels are opened up with consequent hæmorrhage.

In the meantime the uterus enlarges, the endometrium becomes converted into decidua (which will subsequently be cast off), and the cervix may begin to soften.

Termination. When one of the blood vessels in the tubal wall is eroded, the flow of blood is strong enough to detach the ovum which dies and becomes surrounded by clot to form a mole. This is then extruded through the fimbrial end of the tube, accompanied by hæmorrhage. The blood may clot in the region of the end of the tube (peritubal hæmatocele) or fill the pelvis forming a pelvic hæmatocele. This comparatively mild form of the condition is usually known as a tubal abortion.

The more severe type of case is called tubal rupture and usually involves the isthmus. The process is similar to the above, only the amount of hæmorrhage is much greater and the flow more forceful, so that, after killing the ovum, it bursts through the thinned wall of the tube and floods the peritoneal cavity.

Very rarely rupture of the tube may occur without causing the death of the ovum through the accompanying hæmorrhage. The ovum may then spread its trophoblastic attachments through the rent. If this happens on the peritoneal surface secondary abdominal attachments may be secured and the pregnancy continue to develop. Similarly, through a rupture in that part of the tube between the layers of the broad ligament, secondary intraligamentary pregnancy may result. It should be emphasized that these secondary pregnancies are very rare. When they do occur they are difficult to diagnose, and may be discovered only when the sac has again ruptured, or when further intraperitoneal hæmorrhage takes place. If no such accident occurs and the pregnancy goes to term, the fœtus eventually dies, and in cases where no operation is undertaken, is finally converted into a lithopædion. Alternatively, the sac suppurates with consequent discharge of fœtal bones through an abdominal, vaginal or other sinus.

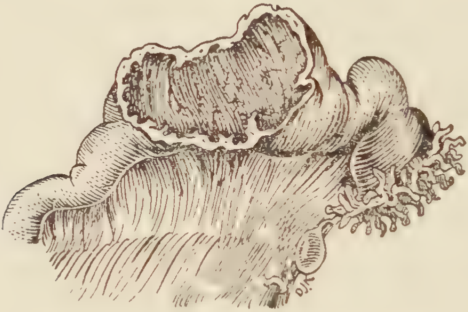


FIG. 19. Rupture of the Fallopian Tube.

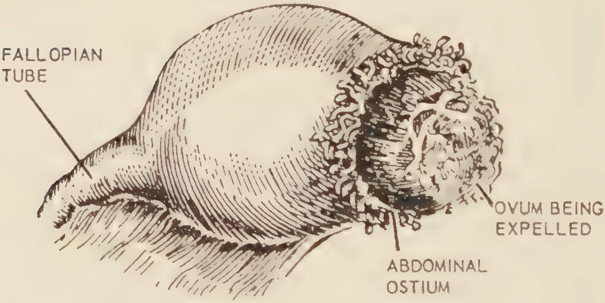


FIG. 20. Tubal Abortion.

Symptoms and Signs. It is rare for the condition to be diagnosed before internal hæmorrhage has occurred. It will therefore be convenient to describe the two common types after this has taken place. Tubal rupture usually occurs about six weeks after the last menstrual period. There may have been other symptoms of pregnancy. There is sudden onset of severe lower abdominal pain with signs of internal hæmorrhage and circulatory collapse. There is pallor, rapid feeble pulse, clean tongue, subnormal temperature, and probably restlessness and air-hunger. Abdominal rigidity is common and later there will be some uterine bleeding from separation of the decidua. The tenderness will probably prevent the palpation of the uterine enlargement or of the tubal swelling. In tubal abortion the symptoms and signs are less severe but may mimic tubal rupture. Quite commonly the attack is very mild and the patient merely complains of some abdominal pain and vaginal bleeding. The latter persists and becomes dark in colour, while the abdominal pain recurs in attacks. If the patient has missed a period the diagnosis is fairly clear, particularly if the tender intraperitoneal blood has clotted and so become palpable. Without this history a diagnosis of subacute salpingitis may be made. This is particularly so if the commencing absorption of the intraperitoneal blood clot leads to the appearance of a dirty tongue, a rise of temperature and an increased erythrocyte sedimentation rate (E.S.R.). In both cases there is a mass in the pelvis behind the uterus. In salpingitis the mass should be bilateral, and in ectopic, unilateral. In a doubtful case the distinction may be made by needle aspiration through the posterior vaginal fornix. If altered blood is found, the condition is an extra-uterine pregnancy.

Treatment. Total salpingectomy is the treatment of choice. A preliminary blood transfusion may be necessary to render the patient fit enough for general anæsthesia. No attempts should be made to repair the tube as this is inviting a further tubal pregnancy.

Antepartum Hæmorrhage

This term refers to hæmorrhage from the genital tract from the twenty-eighth week of pregnancy to term. It may be due to bleeding from a polypus, a varicose vein or a cancer. In this section will be considered only such bleeding as occurs from the placental site consequent upon partial detachment of the placenta.

A. Placenta Prævia (Unavoidable Hæmorrhage)

If any part of a placenta be attached to the lower uterine segment—i.e. within 3 inches of the internal os—it is called placenta prævia. Such a placenta will unavoidably be separated when the lower segment becomes taken up and stretches during the first stage of labour. The consequent hæmorrhage is, therefore, called inevitable or unavoidable. Since the stretching of the lower segment is in part initiated before labour by the agency of the painless Braxton Hicks contractions of pregnancy, the placental separation and unavoidable hæmorrhage may begin before term.

Cause. The placenta may be attached in part or in whole to the lower uterine segment from one of two reasons: (*a*) the ovum may have been implanted there; or (*b*) the ovum, implanted normally in the upper segment, develops placenta not only in the decidua basalis, but also in the decidua capsularis. When the ovum fills the uterus and the decidua capsularis is forced into contact with the decidua vera, the placental formation in the decidua capsularis becomes attached to the decidua vera of the lower segment and is therefore "prævia".

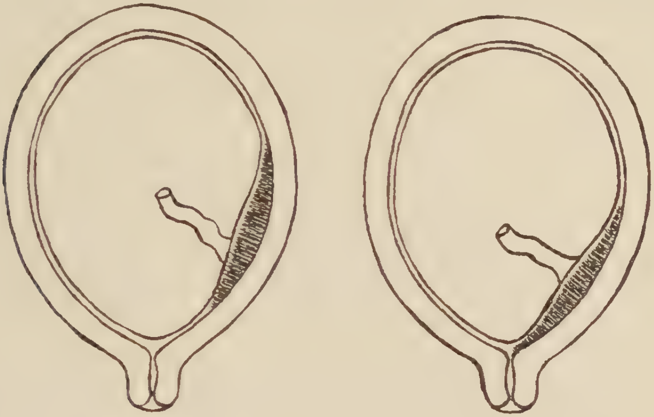
Varieties. Type 1° or lateral. The lower edge of the placenta extends into the lower segment, but does not reach the internal os.

Type 2° or marginal. The internal os is reached but not covered by the placenta.

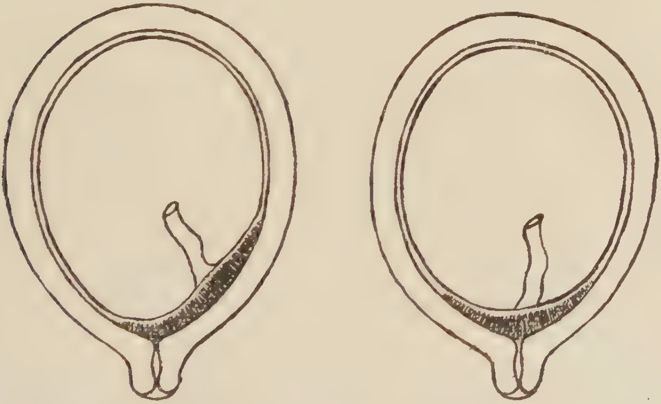
Type 3° or incomplete central. The placenta covers the internal os before the onset of labour, but when the cervix dilates membrane is exposed.

Type 4° or complete central. The placenta completely covers the internal os, even if full dilatation were achieved.

Symptoms and Signs. The initial symptom is sudden, painless, bright red bleeding. The very first hæmorrhage may rarely be severe and even fatal. It is more usual for it to be slight and to cease spontaneously. Even so, the patient is subsequently in danger since a further hæmorrhage may occur at any moment and may be severe.



A. Lateral (Type I). *B.* Marginal (Type II).



C. Complete (Type III). *D.* Central (Type IV).

FIG. 21. Types or Degrees of Placenta Prævia.

On abdominal examination there may be a malpresentation and the head is not engaged since the placenta occupies so much of the lower pole of the uterus that there is no room in the pelvic brim for the full-time fœtal head. A vaginal examination must not be performed and, if the patient is in her own home, she is given morphine gr. ¼ and transferred to hospital. Should the first hæmorrhage have ceased and should the signs be equivocal the diagnosis must remain in doubt. Placenta prævia will be suspected in the absence of signs of pre-eclampsia. While the patient is under observation useful information is occasionally obtained by radiological investigation. Soft tissue films may reveal the shadow of a normally situated placenta and exclude placenta prævia. The distance between the fœtal head and sacral promontory or symphysis pubis may be much increased and this would suggest placenta prævia.

Once a case of antepartum hæmorrhage has been admitted to hospital on the diagnosis of suspected placenta prævia, she should stay in the hospital until she has been safely delivered even if this means weeks of waiting. At first she will be on absolute bed rest and under sedatives, but if no further bleeding occurs she can gradually be allowed to sit up and later to move about the ward. A recurrence of the bleeding indicates an immediate return to the absolute bed rest and sedation—at least temporarily. Nowadays it is usual to continue expectant treatment despite repeated bleedings and in this way many cases of placenta prævia which have started bleeding, say, at the thirty-second week, have been carried on nearly to term with consequent fœtal salvage.

The decision to bring the pregnancy to an end usually implies the making of a preliminary vaginal examination. This must take place in an operating theatre, with the patient anæsthetized and with everything prepared for immediate Cæsarean section and blood transfusion. This vaginal examination is postponed until delivery is indicated. Intervention is desirable in cases of prolonged bleeding or a severe blood loss in excess of 15 fl. oz., or when labour pains begin or when term has been reached. With regard to the examination, the finger is introduced through the cervix and then withdrawn. If no bleeding is excited the finger is inserted a little farther and this is repeated until the placenta has been excluded from the lower segment. Blood clot below the presenting part may feel like placenta, but the placenta has a stringy consistency and the blood clot breaks down under gentle pressure from the examining finger.

Treatment. This must first be undertaken in the patient's own house. The general practitioner's only duties are to find out the lie of the fœtus, to exclude gross pre-eclampsia, to obtain an idea of the patient's general condition and the amount of blood loss, to give morphine ¼ grain and to accompany the patient during her transfer to hospital in an ambulance. In the exceptional severe case it will be wise to request the local obstetric flying squad, if available, to take charge of the transfer and to give a blood transfusion during the process.

When the patient arrives in hospital it is nearly always found that the bleeding has ceased and that she is quiet and under the influence of the sedative. She should be transferred to a ward and kept at absolute bed rest and under sedation. Blood samples should be taken for grouping, rhesus factor, hæmoglobin and cross-match. If after one week in bed there has been no more bleeding she can be allowed to get up, but she must stay in hospital until delivery.

Very rarely the case arriving at the hospital is still bleeding, and profoundly shocked. This may have resulted from an ill-advised vaginal examination or the onset of strong labour.

A blood transfusion should be started as soon as possible and arrangements made for the performance of a Cæsarean section just as soon as the patient's general condition permits. It is reasonable to assume that a patient bleeding in this manner must be a placenta prævia of severe degree. It must again be emphasized that this type of case is a rarity.

The more usual case will soon have stopped bleeding but frequently when she is up and about there will occur another painless bright red hæmorrhage. Absolute bed rest is repeated. Sooner or later the actual delivery becomes necessary.

If on vaginal examination the placenta is not felt or is only just reached by the finger on the anterior uterine wall then rupture the membranes and await vaginal delivery. More severe degrees of placenta prævia are delivered by Cæsarean section. If bleeding is severe the diagnosis is sometimes assumed and Cæsarean section performed without a preliminary examination.

The lower segment Cæsarean section is the operation of choice. If the placenta is encountered under the incision it is pushed to one side until the membranes are reached. Tear through these, extract the child as soon as possible, and clamp the cord either in the fingers or by a Spencer Wells forceps at the earliest possible moment. This is to prevent the child losing blood through the cord circulation to a placenta, in which there may well be a tear through which fœtal blood could escape.

At Cæsarean section maternal hæmorrhage is controlled by rapid separation of the placenta and intravenous ergometrine 0·5 mg. When delivery has been by the vagina the third stage is again a time of danger because the placenta is already partially separated and the patient is in no condition to stand any further blood loss. The rule therefore is to give ergometrine and to deliver the placenta without delay. If cord traction fails then manual removal is preferable to Credé expression.

Prognosis. The postponement of interference until the child has nearly reached maturity and the more frequent performance of Cæsarean section have greatly improved the fœtal survival rate. Maternal morbidity and mortality have also fallen since the adoption of modern methods of treatment and the discovery of our present potent weapons against sepsis.

B. Accidental Hæmorrhage

This is hæmorrhage after the twenty-eighth week of gestation, due to separation of a placenta which is normally situated—i.e. on the upper uterine segment. In half the cases there will be an associated pre-eclampsia, but in many instances no cause can be found. Occasional trauma, such as over-zealous attempts at external cephalic version, may cause placental separation.

Revealed Accidental Hæmorrhage. The blood may be squeezed out by the uterine contractions and, making its way between the membranes and the uterine wall, appear at the vulva. The hæmorrhage is slight, does not recur, and causes little inconvenience. If the bleeding is more severe the partial separation of the placenta constitutes a grave threat to the fœtus. When labour begins there may be evidence of fœtal distress. Treatment is along the lines laid down for placenta prævia. Many obstetricians now perform Cæsarean section for severe revealed accidental hæmorrhage because of the high fœtal loss in labour.

Abruptio Placentæ (Concealed Accidental Hæmorrhage). This is the most severe form of accidental hæmorrhage. There is sudden onset of severe continuous abdominal pain and backache. Severe internal hæmorrhage causes profound shock and hypotension. There is a reflex bradycardia and the uterus, which is distended by blood clot, feels woody hard. Fœtal parts cannot be felt and the fœtus is dead. Albuminuria is invariably present and there is slight bleeding per vaginam. The patient is now in a very grave state indeed, and it might be fatal to attempt any active interference. Instead, she is to be treated by warmth, quiet, morphine and blood transfusion until the shock passes. Improvement in her condition is generally accompanied by the return of rhythmic uterine contractions. It is now an advantage to rupture the membranes and hasten delivery. In about 5 per cent. of these cases there may be a fibrinogen deficiency and this may lead to postpartum hæmorrhage following delivery.

Mixed Accidental Hæmorrhage. Many cases of accidental hæmorrhage are mixed and have an element of both revealed and concealed bleeding. Although the mother may be little disturbed, the threat to the baby is always severe and only vigilance for the early signs of fœtal distress will permit the obstetrician to save the baby by Cæsarean section.

Section Two

LABOUR

CHAPTER ELEVEN

Definition of Terms

Lie means the relation of the long axis of the child to that of the uterus. Thus the lie may be longitudinal, oblique or transverse to that of the uterus.

Presentation is that part of the child which is lying over or in the brim of the pelvis. We thus have vertex, face, brow, breech and shoulder presentations.

Position means the relation of some particular part of the presentation, which is termed the denominator, to some particular part of the mother's pelvic brim. Thus a first presentation of the vertex is when the fœtal occiput (denominator) lies against the left iliopectineal eminence of the maternal pelvis.

Attitude is the term employed to indicate the position of the child's head and limbs with relation to its trunk. The normal attitude is flexion.

Engagement. When the biparietal diameter of the fœtal skull has passed below the plane of the pelvic brim, the head is stated to be engaged.

The forces acting in labour to cause the expulsion of the child are the contractions of the uterus aided by expulsive efforts of the abdominal muscles. The uterine contractions are involuntary, intermittent and painful. The intermission permits the fœtus to recover from the pressure effects of the uterine contraction. Inhibition of the contractions may be caused by fear, full bladder and full rectum.

Small, painless uterine contractions (Braxton Hicks) are present throughout the greater part of pregnancy. With the onset of labour these become painful, and the word "pain" is used as a synonym for a uterine contraction.

The uterus is divided into approximately an upper two-thirds, called the upper segment, which undergoes rhythmic contractions during labour, and a lower one-third (the lower segment) which is more passive, becomes thinned and taken up by the upper segment. By the end of the second stage the lower segment is in continuity with the fully dilated cervix and vagina which together form the birth canal.

In addition to contraction, the uterine muscle has a special power of retraction. This retraction is peculiar to the uterus and enables the uterine muscle to maintain a part of the shortening initially effected by each contraction. Thus, after many contractions, the uterine fibres have become greatly shortened, and yet they are still able to make full contractions of normal amplitude. The best example of retraction is that of the uterus after the expulsion of the child. At this time the uterus has been reduced to a fraction of its previous size, and its muscle fibres are shortened and thickened, but it still is capable of making powerful contractions. This can be appreciated by the palpating hand which feels the uterus hardening during such a contraction. The importance of this power of retraction is twofold. By retraction the uterine muscle is able to maintain part of the descent of the fœtus which it has gained by the previous contraction; and, second, the short retracted fibres after the birth of the child are still able to make full contractions, and so express the placenta and control postpartum hæmorrhage.

Causation of Labour. This is not at present understood. It is possible that the uterus becomes increasingly sensitive to circulating oxytocin, which is the hormone derived from the posterior pituitary. Overdistension of the uterus by twins or hydramnios will often start premature labour. Distension of the uterus is not the only mechanism responsible for the onset of labour.

Whatever may be the cause, labour is recognized by the character of the pains which coincide with a palpable uterine contraction. There may be a discharge of blood and mucus. At first the pains are at intervals of perhaps twenty minutes. Later they become more frequent, more powerful and more prolonged. The pains of the first stage, when the lower segment and cervix are being stretched, are felt chiefly in the back and radiating forward across the abdomen. With the beginning of descent of the child the pains alter in character, becoming expulsive in type, forcing the woman to strain down and usually to make grunting noises.

Influence of the Pains on the Mother. The pulse rate and blood pressure increase during the pains, but return to normal during the interval. The temperature rises slightly during labour.

CHAPTER TWELVE

Clinical Phenomena of Labour

Premonitory Symptoms

(*a*) During a first pregnancy, usually about four weeks before term, the lower part of the uterus with the contained lower fœtal pole sinks down into the pelvis, and thus relieves pressure on the diaphragm. Some easing of the symptoms of pregnancy results, and this phenomenon is known as "lightening". If this descent of the uterus into the pelvis fails to occur in a primigravida it should give rise to suspicion that there is some obstruction; but it should be remembered that in multiparous women this descent into the brim occurs as a general rule only with the onset of labour.

The causes of failure of the fœtal head to engage in the brim in a primigravida at thirty-eight weeks are:

Occipitoposterior position of the vertex.
Malpresentation, e.g. face or brow.
Contracted pelvis.
Large baby with large head.
Hydrocephalus.
Pelvic tumour, e.g. ovarian cyst or uterine fibroid.
Hydramnios.
Placenta prævia.
Full rectum.
Full bladder.
Rarely there is no discoverable cause.

(*b*) "False pains" are frequently felt a week or so before labour really starts, and are often mistaken, particularly by the nervous patient, for established labour. They are, however, distinguishable by the fact that they are irregular, felt in the abdomen, are not accompanied by a discharge of blood and mucus. They do not tend to increase in force and frequency and the cervix does not dilate.

THE THREE STAGES OF LABOUR

The First Stage

The first stage is from the onset of labour to the time when the lower segment and the cervix are fully dilated and ready to permit the passage of the child. It generally lasts about 12–18 hours in a primipara and about half this time in a second labour.

The onset of labour is recognized by the palpable uterine contractions which coincide with the abdominal pain and backache, and by the progressive dilatation of the cervix. Before the onset of true labour the painless Braxton Hicks contractions of pregnancy have often produced to some extent a commencement of the dilating process that is characteristic of labour. Consequently it is not unusual to find that the internal os has been stretched open, the cervical canal largely obliterated and the presenting part resting on the external os, before labour has really started. In theory, however, this phenomenon is characteristic of the onset of labour, and is known as the taking up or "shortening of the cervix".

The mechanism by which this is effected is not entirely understood. Many believe that dilatation is caused by the downward pressure of the fœtal head and an upward pulling effect of the upper segment. The cervix is thus passively stretched and the internal os gradually slides upwards and outwards in continuity with the lower segment. Others believe that the longitudinal muscle fibres of the uterus are extended downwards into the cervix and when these contract the cervix is progressively unfolded. Probably both mechanisms occur to a variable degree.

With this dilatation a small bag of the fœtal membranes, with contained liquor amnii, is pushed by the contracting uterus through the external os. During the subsequent contractions this bag of membranes becomes distended by the liquor amnii under pressure, and may assist, to some extent, the dilatation of the cervix. The side walls of the birth canal grip the fœtal head which thus separates the amniotic cavity into a bag of liquor amnii below the head, the forewaters, and a bag of liquor above the head, the hindwaters. When the head is relatively high during labour, much liquor will leak past the head causing marked distension of the forewaters. In consequence, the membranes may rupture before full dilatation of the cervix. As the head descends and is gripped by the lower segment there is less chance for liquor to cause further distension of the forewaters, but after each contraction the pressure of liquor in the forewaters will tend to push the head upwards. Artificial rupture of the membranes below the fœtal head will permit progressive descent and usually accelerates cervical dilatation. This should not be done until the cervix is at least half dilated and the head engaged in the pelvic brim.

Second Stage of Labour

When full dilatation of the lower segment and cervix is complete and the membranes have ruptured, uterine contractions push directly on the breech of the child and begin thus to force the fœtus to progress in a downward direction. In this descent the uterine forces are supplemented by the mother's own abdominal muscles which are called involuntarily into play. The breath is held, the head is brought forwards, the legs are flexed and abducted and she bears down in a manner similar to straining at stool. As the fœtal head descends through the pelvic cavity, a certain amount of advance takes place during each pain, while recession takes place in the intervals. At the outlet this process is visible so that it is possible to see the perineum being alternately distended and relieved; but, owing to the power of retraction, the uterus holds some of the advance gained by each pain. Presently the progress of the child becomes obvious and eventually delivery is secured.

This expulsion of the child terminates the second stage of labour, which, as we have seen, begins at full dilatation of the cervix. The duration is about one hour in a primpara, and half this at a second labour.

Third Stage of Labour

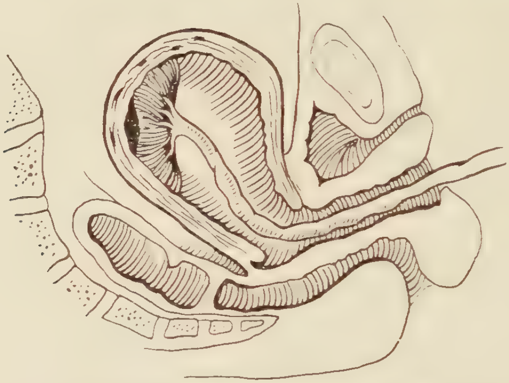
This is from the birth of the child to the expulsion of the placenta and membranes.

Shortly after the child is born the uterus, though reduced to a fraction of its previous size and kept so by retraction, does not undergo any active contractions. After a short delay these contractions return and these together with the retraction serve to complete the separation of the placenta and to take part in its expulsion.

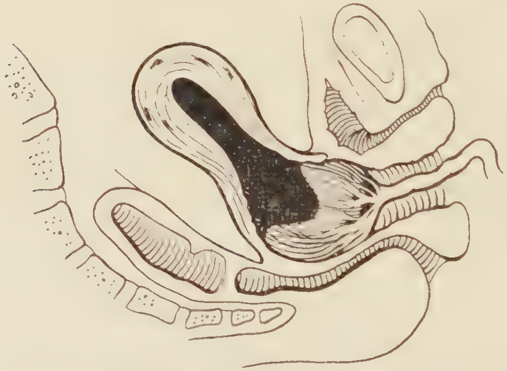
The mechanism of placental separation is due initially to retraction of the placental site. The placenta is about 8 inches in diameter and is of a firm incompressible structure. In consequence, when the placental site is reduced in size a shearing force is set up between the placenta and its attachment. The placenta buckles and this causes separation over a small area usually near the centre. A further factor assists in this. When any part of the placenta has become separated, bleeding between the uterine wall and the separated portion occurs, particularly when the uterus is relaxed. With the next contraction this blood is squeezed between the placenta and the uterine wall, and is therefore forced to spread out in this plane, which forms the line of least resistance. It thus assists in completing the placental separation.

Expulsion

The separated placenta is next expelled into the vagina by further contractions of the uterus. The fact that separation has occurred is evidenced by the uterus becoming smaller, more narrow, harder, more mobile, and by its fundus rising up in the abdomen to a level usually just above the umbilicus.



A. The uterus is beginning to retract, the placenta has separated at its centre and a small retroplacental hæmatoma has formed.



B. The placenta has now completely separated and the uterus, which is now retracted, has expelled it into the vagina.

FIG. 22. The Mechanism of Separation and Descent of the Placenta.

In addition, the cord may be seen to have descended farther. The placenta is now ready for expulsion from the vagina. This is sometimes secured by voluntary efforts but, more often, the obstetrician, having secured a uterine contraction, pushes the contracting uterus downwards, in the direction of the pelvic axis, thus using it as a piston to push out the placenta from the cylindrical birth canal. Once the placenta has definitely become separated there is no reason why this process should not be aided by gentle traction on the cord in the presence of a strong uterine contraction.

Prevention of Post-Partum Hæmorrhage

When the placenta has become separated, it will be clear that inside the uterus is a raw surface several inches in diameter. It would be expected that tremendous hæmorrhage would take place from this placental site, but this is prevented by the thickened retracted uterus which firmly grips the blood vessels running between the muscle fibres. Also, the extreme tortuosity of the uterine artery after delivery renders it difficult for blood to course through it. As a result, the recently delivered uterus is relatively avascular, and thus the duty of the retracted fibres, that of keeping blood from the placental site, is facilitated.

It must be appreciated that hæmorrhage will occur if the uterus becomes atonic or if retraction is interfered with by the placenta remaining partly or wholly in the uterus. The danger of postpartum hæmorrhage must therefore be regarded as present until (i) the uterus is empty, and (ii) retraction is complete and lasting.

CHAPTER THIRTEEN

Vertex Presentations

Frequency

Vertex presentations occur in about 95 per cent. of cases. The vertex of the child's head is the area bounded by the anterior and posterior fontanelles and by the parietal eminences. In vertex presentations the head enters the pelvic brim with the sagittal suture in or near one of the oblique diameters, with the occiput anterior or posterior. There are, therefore, four positions of the vertex, named according to the location of the occiput.

Positions

1. *Left Occipito-Anterior.* This is the commonest. The occiput is opposite the left ilio-pectineal eminence, the forehead towards the right sacro-iliac joint. Therefore, the antero-posterior diameter of the head is in the right oblique diameter of the pelvis.
2. *Right Occipito-Anterior.* The occiput is to the right and in front, the forehead at the left sacro-iliac joint.
3. *Right Occipitoposterior.* The occiput is to the right and behind, the forehead near the left ilio-pectineal eminence.
4. *Left Occipitoposterior.* The occiput is to the left and behind.

The uterine cavity is relatively narrow at its lower pole and more spacious near the fundus. As the baby kicks against the uterine wall it will tend to turn until the feet occupy the upper segment. This probably accounts for the head usually presenting and gravity has no influence.

The anteroposterior diameter of the head is longer than the transverse. The long anteroposterior diameter tends to occupy the right oblique diameter of the pelvis, since part of the left oblique is occupied by the rectum.

Owing to the flexed attitude which is normal to the child *in utero*, the convex back of the child tends to lie towards the front of the mother's abdomen while the concave fœtal abdominal aspect adapts itself most easily to the front of the convex maternal lumbar spine. Flexion of the fœtal head brings the vertex over the cervical os.

Mechanism in Left Occipito-Anterior Position

The head engages in the brim with the sagittal suture in the right oblique diameter. During the second stage of labour descent of the head takes place and is accompanied by the following movements:

1. *Flexion.* This is the normal attitude of the child, and becomes increased during the progress of labour. The effect of flexion is to cause smaller diameters of the head to pass through the pelvis. The flexor muscles of the cervical spine are stronger than the extensors and this normally maintains the attitude of flexion, but this is assisted by the action of the uterus and birth canal.

The head being egg-shaped, in passing through a cylindrical cavity the long axis of this egg will naturally adapt itself to the long axis of the tube. When the long axis of the head is brought into line with the long axis of the pelvis, the fœtal head will be found to be fully flexed.

The thrust of the uterus transmitted through the fœtal spine acts on the occipital end of the head and by pushing this downwards, while the forehead remains at its original level, flexion is produced.

2. *Internal Rotation.* This is the rotation of the head of the child that takes place within the pelvis when it descends on to the pelvic floor. It is convenient to consider this as a sloping gutter falling forwards, medially and upwards. It will be

clear that anything striking this pelvic floor will slide downwards and forwards, and, roughly speaking, this is what happens to the fœtal head. The sequence of events, therefore, is as follows: the uterus pushes the child down, and as the head is well flexed the occiput will be the lowest point and will first reach the pelvic floor; striking this, it will slide downwards and forwards, and thus be rotated into the anterior position.

3. *Extension.* When the head has been pushed down until the nape of the child's neck is resting against the subpubic arch, we can imagine it as being acted upon by two forces. There is a downward thrust of the uterus, and a thrust by the perineum in an upward and forward direction. The resultant is a force acting forwards and a little downwards, and this causes the occiput to move forward beneath the subpubic arch, so that the chin moves away from the chest; in other words, the head extends. Thus the bregma, forehead and face successively pass the perineum.

4. *External Rotation.* At the moment the head is being born the shoulders are still lying in the left oblique diameter. Therefore, there is torsion on the child's neck. As soon as the head is born and free this twist undoes itself and this movement constitutes "restitution" through 45 degrees. With the descent of the trunk the shoulders are rotated, so as to lie anteroposteriorly between the two halves of the pelvic floor, and so as to pass through the outlet in the anteroposterior diameter. With this movement of the shoulders the head is further rotated through another 45 degrees in the same direction as it moved during the course of restitution. This constitutes external rotation.

5. *Expulsion of the Trunk.* The movement of the shoulders has been considered under restitution and external rotation. The remainder of the trunk following successively rotates from the left oblique into the anteroposterior diameter, so that finally the hips pass through the outlet with the bisiliac diameter lying between the subpubic arch and the tip of the coccyx.

Mechanism in Right Occipito-Anterior Position

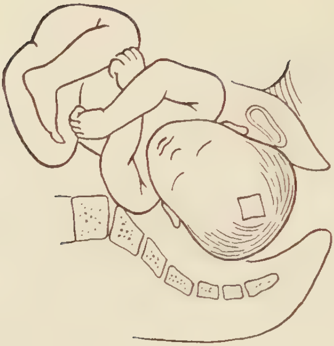
This is similar to that which obtains in the first position.

Mechanism in the Third and Fourth Positions

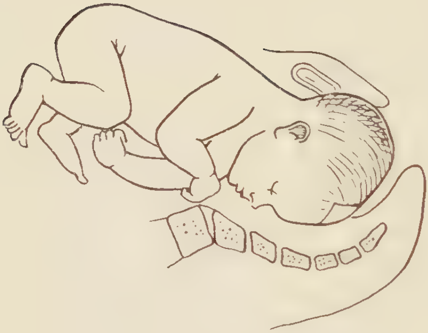
In these positions of the vertex the occiput is posterior, consequently the child's back is posterior and directed towards the mother's convex lumbar spine. This naturally interferes with the child's attitude and so, even before labour, flexion is deficient. Most of the fœtal extension occurs in the lower cervical spine which is resting against the back of the symphysis pubis instead of directly on to the cervix. In consequence the cervix dilates slowly and labour may be prolonged. The tendency towards extension of the head and the change in uterine axis pressure delays the descent of the head and may delay or prevent rotation of the head to the occiput anterior position.

If the head remains flexed and is pushed down on to the pelvic floor, the occiput will be the lowest point and will slide forwards along the pelvic floor to the front. This so-called "long rotation" is through the long distance of three-eighths of a circle. The torsion on the fœtal neck causes the shoulders and trunk to follow the rotation at least through half a circle. When the head has been delivered restitution occurs back through 45 degrees to a position similar to the first or second positions of the vertex.

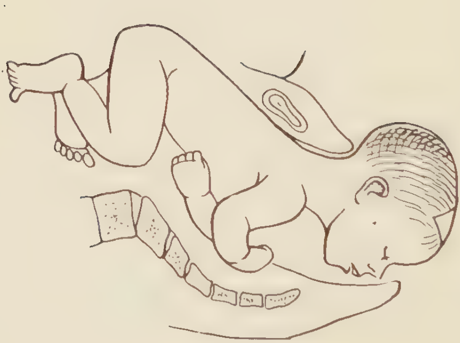
If the head is poorly flexed and the resistance of the birth canal prevents descent on to the pelvic floor the posterior position of the head will persist. Further descent as a posterior position may occur if the anteroposterior diameters of the pelvis are large and particularly in the multipara whose pelvic floor muscles offer less resistance. If the head is pushed to the outlet of the pelvis it may be born in the posterior position, so-called spontaneous face-to-pubes delivery. The forehead is fixed against the back of the pubis around which flexion now takes place. The occiput gradually and with difficulty distends the perineum. At the point of crowning



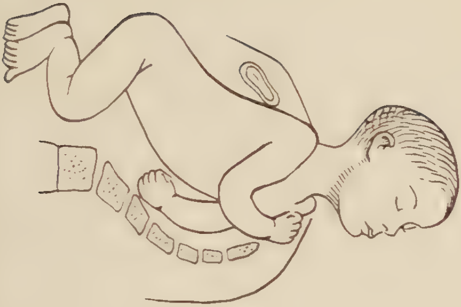
A. The head engages in the pelvic brim with the occiput directed laterally and the sagittal suture in the transverse.



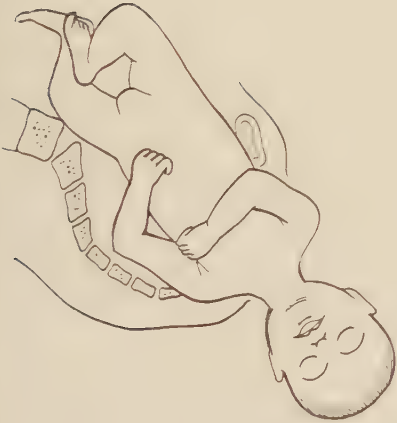
B. As the head descends it undergoes internal rotation through a right angle to bring the occiput anterior.



C. The head is born by extension.



D. The internal rotation of the head causes torsion on the neck. When the head is free restitution occurs back through 45 degrees.



E. External rotation through a further 45 degrees brings a shoulder behind the symphysis pubis.

FIG. 23. Mechanism of Labour.

the large occipito-frontal diameter ($4\frac{1}{2}$ inches) distends the vulva and may cause severe lacerations of the perineum extending into the anal canal. A large medio-lateral episiotomy is preferred. As soon as the occiput is free, the head then undergoes rapid extension and the face is born.

In the primipara the persistent occipito-posterior position may cause obstruction to delivery. It will then be necessary to rotate the head manually under general anæsthesia and extract with forceps. The expert may occasionally use Kjelland's forceps to effect the rotation in difficult cases. If the head is very low and visible at the vulva it may be permissible to perform a forceps delivery face to pubes.

In other cases the head undergoes partial rotation, but then becomes obstructed with the sagittal suture running transversely and the occiput in the lateral position. This condition is known as deep transverse arrest and is treated by rotation and forceps extraction.

Changes in the Shape of the Head Produced by Labour

1. It is diminished in size by blood and cerebrospinal fluid being squeezed out of it.

2. It is "moulded" by the bones slipping over or under one another. One parietal bone overlaps the other. Both parietal bones overlap the occipital bone. Both parietal bones overlap the frontal bones. Because the frontal bones are fixed to the face by cartilage they remain separated and the frontal suture remains mobile.

Caput Succedaneum

This is an area of œdema on that part of the child's scalp which, lying over the internal os, is unsupported. This caput, therefore, appears in occipitoposterior cases in the region of the bregma, while in occipito-anterior cases it is over the posterior part of the parietal bones; in left occipito-anterior cases, on the right parietal; in right occipito-anterior cases, on the left parietal. The caput succedaneum and the changes due to moulding disappear in a day or so after birth.

CHAPTER FOURTEEN

The Management of Natural Labour

It is essential that labour should be conducted with full antiseptic and aseptic precautions. The vulva and adjoining skin should be shaved and disinfected with an antiseptic obstetric cream. Fresh application of the antiseptic should be made before every examination and it should not be washed away by the use of weaker lotions. The hands of the accoucheur should be washed and scrubbed as for a surgical operation and disinfected in spirit. Sterile gloves and a sterile gown should be worn, and if the gloves become soiled they should be washed in antiseptic lotion and smeared with obstetric cream. It is almost useless merely to rinse them in a dilute solution of antiseptic. At all times when the vulva is exposed, either during labour or in the puerperium, everybody in the room with the patient should wear an efficient mask. In this way the risk of infection being conveyed from the attendants' throats is minimized.

Recognition of the Onset of Labour

The patient complains of pains which recur at regular intervals. They are felt in the lower abdomen and the lower part of the back. They are synchronous with palpable hardening of the uterus.

After a while there appears at the vulva a "show" of mucus and blood, which is a most valuable indication that labour is established. On vaginal examination the cervix will be found not to project in the usual manner, but to be "shortened" or flattened out over the presenting part. Soon it will be found dilated to some extent and through the dilated os the membranes can be felt to become tense and to bulge during each uterine contraction.

Abdominal Palpation

In "normal" labour it is the vertex that presents in the pelvic brim. In primigravidæ the head descends well into the brim about four weeks before labour, but in subsequent labours it may not be engaged until after the onset of labour.

The position of the child can be recognized by abdominal palpation as follows: stand facing the mother's feet and press the palmar aspect of the fingers downwards and inwards towards the pelvic brim where they will meet the hard resistant head. On palpating the sides of the mother's abdomen, the fœtal limbs will be felt as knobs on one side, while on the other side is found the hard, smooth back. Facing the mother's head the breech can be palpated at the fundus. With the extended thumb and fingers of the right hand grasping the lower uterine segment, another grip of the fœtal head (Pawlik's grip) can be obtained if the head is above the pelvic brim. This grip often causes discomfort and is not recommended. If one hand is pressed against the side of the abdomen at the level of the umbilicus it will encounter more resistance over the fœtal back than over the abdomen and limbs. Finally, the diagnosis is confirmed by listening to the fœtal heart, which will be heard over the child's back. But it must be remembered that in posterior positions, when the child's chest is thrown forward over the convex maternal lumbar spine the fœtal heart is often heard in the midline anteriorly at or below the mother's umbilicus.

With these investigations, which should be practised in antenatal clinics, it becomes a rapid and simple matter to decide definitely to which of the four positions of the vertex the particular case belongs. Moreover, the depth to which the head has sunk into the brim becomes easily appreciated.

Difficulty will be experienced only if the uterus is unduly irritable, if there be excess of liquor amnii, if the examiner's hands are cold, if the mother's abdominal muscles are held tightly, if her bladder is full, or if insufficient practice has been obtained.

Management of the First Stage

As soon as labour begins the patient should have a warm bath. She should empty her bladder and have the rectum emptied either with a "Dulcolax" suppository or a small soap enema. Subsequently, she should be encouraged to walk about, but may wish to sit during a pain. With increasing severity of the pains some relief should be given by the administration of fairly large doses of such sedatives as chloral hydrate 60 gr. given per rectum and combined with pethidine hydrochloride 150 mg. given intramuscularly. The pethidine may be repeated after 2 to 3 hours. When this has been given the mother should be in bed. It is not possible in a book of this size to discuss the management of labour with the more intensive methods of producing analgesia which may occasionally seem requisite. It is sufficient here to indicate that in cases when the first stage is prolonged, e.g. inertia, occipitoposterior positions, etc., considerable ingenuity is required to devise means of securing adequate analgesia without inhibiting the natural progress of labour.

In a straightforward case, in order to minimize the risk of introduction of sepsis, not more than two vaginal examinations are necessary. One is made at the first visit to the case. This is to confirm that the patient is in labour and to find out the degree of dilatation of the cervix. The second is made when the membranes rupture—i.e. usually at about three-quarters dilatation of the os. At this examination the dilatation of the cervix is assessed, it is ascertained that the cord has not prolapsed, and the position of the head, previously identified on abdominal examination, is confirmed. This is done by palpation of the suture lines. When the occiput is anterior the three radiating sutures around the lambdoidal fontanelle, now obliterated by moulding, is recognized behind the lower border of the symphysis pubis. When the occiput is posterior the four radiating sutures around the anterior fontanelle, now much reduced in size by moulding, is recognized. The hard convex occipital bone and the relatively flat frontal bones with the mobile frontal suture assist recognition. The palpation of the fœtal ears may lead to the identification of the occipital pole, but this causes severe maternal discomfort and should be reserved for examination under anæsthesia prior to instrumental delivery.

If the membranes do not rupture spontaneously when the cervix is nearly fully dilated, they should be punctured artificially.

Management of the Second Stage

After the membranes have ruptured there may be a short lull in the pains before they soon return with greater intensity. They also alter in character, becoming "bearing down" in type, and recognizable by observation of the patient, whom they cause to grunt. During this stage of labour the patient should be lying on her back with her feet supported on the bed. With each contraction the thighs are flexed on the abdomen, the hands placed in the popliteal fossæ, the head brought forward and the glottis closed. In this way she will bear down in a manner similar to defæcation and will assist the uterus in bringing about the descent of the child. Unless the fœtal head is visible at the vulva within two bearing down efforts a further vaginal examination is made to confirm full cervical dilatation. In no circumstances should the mother be allowed to bear down on an undilated cervix.

The fœtal heart should be auscultated after every other contraction and its rate recorded. A marked rise or fall in the fœtal heart rate or, worst of all, a rise followed by a severe fall, is evidence of fœtal distress. The passage of meconium in the case of a presentation other than a breech is also suggestive of fœtal distress, but is not so important as a change in the fœtal heart rate.

When the head reaches the perineum it will be visible at the vulva. It will be seen to advance during the pains and to recede in the intervals, until the biparietal diameter has passed through the gap between the two levator ani muscles. The head will then remain widely distending the vulva, and will not recede. Up to this point the care of the perineum has consisted in resisting with the flat of the hand the too rapid advance of the head in those cases in which this tends to occur. Such an unusually rapid advance may cause severe vaginal and perineal lacerations. Many obstetricians prefer to deliver the baby with the mother lying on her left side. The mother is turned between contractions, but this should be delayed until the head is distending the vulva. Throughout the second stage the patient may obtain further analgesia by inhalation of Trilene vapour 0·5 per cent. from one of the modern inhalers which give a fixed concentration of the vapour. Alternatively gas and oxygen, gas and air, or other anæsthetic may be used, and during the delivery of the fœtal head the anæsthesia should be deepened sufficiently to abolish the expulsive contractions of the mother's abdominal muscles.

The head is born by extension with the suboccipital point resting against the subpubic arch. The head, however, is kept flexed until the occiput is well free of the anterior part of the vulva and the nape of the neck is hitched beneath the symphysis. The delivery of the head is completed between contractions and as the vulva passes over the parietal eminences it is said to be crowned. Extension of the head is assisted by gentle massage of the scalp towards the occiput and pressure on the baby's chin from behind the rectum. Many obstetricians prefer to use a vulval infiltration of local anæsthesia such as 1 per cent. lignocaine hydrochloride rather than general anæsthesia for crowning the head and in these circumstances a controlled voluntary bearing down effort between contractions may assist the obstetrician to crown the head.

If the perineum is inelastic or seems in danger of laceration this should be anticipated by making a deliberate incision with a straight, blunt-pointed scissors. This incision, or episiotomy, is made from the central point of the perineum backwards and laterally at 45 degrees to the midline for about one inch. If further laceration occurs during delivery the episiotomy will extend lateral to the anal spincter.

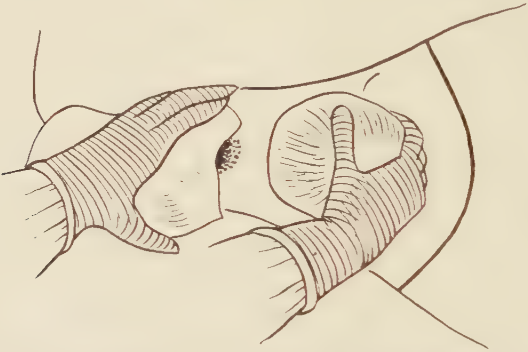


FIG. 24. The head is born by controlled extension. As the vulva stretches over the parietal eminences the head is crowned and then the perineum is pushed over the face.

As soon as the head is born feel along the child's neck to see if the cord is round it. If so, draw it down and free the loop by passing it over the child's head. If this is impossible, divide the cord between two clamps.

Swab the eyelids with a dry gauze swab. Mucus, liquor and blood is aspirated from the mouth, nose and upper respiratory passages through a sterile mucus extractor with a soft rubber tube attached.

When the head is born restitution and external rotation will soon follow to bring the shoulders into the antero-posterior position. The head is pulled backwards against the perineum and a further bearing down effort between contractions effects delivery of the anterior shoulder. The head is then swung forwards over the pubis and the posterior shoulder emerges over the perineum. The fœtal trunk and lower limbs are then rapidly expelled from the birth canal. If there is difficulty in delivering the anterior shoulder the mother should bear down during a contraction, moderately heavy traction is applied to the head, and this together with a deep episiotomy usually overcomes the obstruction.

The delivery being completed, the child is turned on its side to prevent inhalation of mucus, and aspiration is completed. Within a few minutes the cord will have ceased to pulsate. Three Spencer Wells forceps are applied and the cord divided so as to leave one forceps on the maternal end of the cord and two on the fœtal end. Later the clamps can be replaced by ligatures placed about 2 inches from the child's umbilicus. It will be found useful to put a marker ligature on the cord a short distance from the vulva. An increase in the distance of this mark from the vulva will be evident when the cord descends, consequent upon the separation of the placenta.

Management of the Third Stage

The patient should be turned on to her back, and the attendant's duty is to observe the uterus to make sure that it does not relax and become distended by postpartum hæmorrhage. The observation can in most cases be carried out by sight and it is usually unnecessary to handle the fundus. If this is not feasible, the left hand should rest on the uterus to observe its condition. The uterus should not be massaged as this may lead to an abnormal constriction ring contraction and retention of the placenta.

Uterine contraction and retraction will expel the placenta into the vagina. The characteristic signs of placental descent have been previously described. A further uterine contraction is awaited or encouraged by gentle massage and the hard uterus is grasped and pushed downwards and backwards in the direction of the axis of the pelvic brim. As the placenta emerges it is caught and then rotated to twist the membranes into a leash. In this way the membranes are stripped off the uterine wall without tearing and come away complete. An intramuscular injection of 0·5 mg. ergometrine is given and the vulva cleansed. Lacerations are then searched for and repaired. Finally, a sterilized pad is applied to the vulva, and kept in place by a T-bandage.

The uterus must be observed for another half hour, and massaged from time to time if it shows signs of relaxing. At the end of this time the patient is made finally comfortable, and her pulse and temperature taken and recorded.

If the placenta has not separated normally within thirty minutes of the birth of the child, or if in the meantime undue hæmorrhage has occurred, the placenta should be delivered without further delay. In these circumstances the bladder is emptied and ergometrine 0·25 mg. is given by intravenous injection. After waiting one minute by the clock one hand is placed on the fundus and the other applies traction to the cord in a backwards and downwards direction. Traction is only made if the fundus can be easily felt. If this fails to deliver the placenta a general anæsthetic will be necessary to perform a manual removal. Until recently it has been a common practice to squeeze the uterus to effect separation of the placenta in cases of delay, but this Credé's manœuvre is always painful for the patient and is potentially dangerous. Repeated attempts may cause severe shock and particularly when there is an associated blood loss. Some obstetricians may still prefer to attempt one Credé's expression with the patient's central nervous system protected by general anæsthesia, but without anæsthesia it may amount to little short of a brutal assault.

Management of Occipitoposterior Cases

In the majority of cases the occiput rotates forward, and no special management is required. When the occiput rotates backwards with the production of a persistent occipitoposterior position, the second stage should be allowed to proceed for one hour (providing neither maternal nor fœtal distress appears during this time), so that it can be seen if spontaneous delivery face-to-pubes will take place. Usually any advance is slow and if at the expiry of one hour a spontaneous delivery seems unlikely then manual rotation to an occipito-anterior position and delivery completed by forceps under general anæsthesia should be performed. With the usual antiseptic precautions the accoucheur then passes a hand into the vagina, grasps the head in its transverse diameter, rotates the occiput to the front, assisting this movement by abdominal manipulation applied to the child's trunk, and delivers with the forceps. For a description of other methods of manual rotation of the fœtal head consult larger textbooks. If manual rotation completely fails, an attempt should be made to deliver with forceps, though the head remains in the occipitoposterior position. In attempting to deliver a baby face-to-pubes by means of forceps it is important to ensure that the blades grip the fœtal head as far posteriorly as possible and to perform a deep episiotomy. The specialist obstetrician will always prefer to rotate the head before extraction. The expert may occasionally use Kielland's forceps to rotate the head but their use demands special training and in no circumstances should they be used by unskilled hands.

In the case of an occipitoposterior presentation when such great difficulty has been encountered that the child has died undelivered, perforation of the head may be performed.

Precipitate Labour

This is the sudden onset and rapid termination of labour depending on excessive uterine contractions and great laxity of the birth canal.

As a rule no harm results, but occasionally laceration of the cervix and perineum occurs; or the cord is broken, and the child, being suddenly born when the mother is unprepared, may be injured by falling to the ground. Postpartum hæmorrhage sometimes follows.

The parturient woman should lie down as soon as she recognizes the onset of labour. The doctor should, on his arrival, abolish the voluntary expulsive abdominal movements by the rapid induction of anæsthesia or the intravenous injection of pethidine 100 mg.

CHAPTER FIFTEEN

The Puerperium

Condition of the Patient after Labour

Shortly after delivery the mother may experience slight shivering, but this is without special significance. A rise of temperature (to about 38°C, 100°F) often occurs, particularly in primiparæ, during the first twenty-four hours after labour, and can be disregarded. Subsequently the temperature should remain normal throughout the puerperium. The pulse rate averages about 75 per minute.

During the first few days after labour the mother may experience some difficulty in passing urine. This may be due to bruising around the urethra and a tendency to atonia of the bladder. If normal privacy, encouragement and reassurance fail it may be necessary to pass a catheter. Occasionally continuous open bladder drainage for 2 to 3 days will be indicated to allow the bladder to regain its normal tone. Sulphonamides are given to prevent urinary infection.

The bowels are usually constipated and the appetite indifferent during the early puerperium. If the abdomen becomes distended, an enema should be given. It is advisable to administer an aperient, e.g. Dulcolax 2 tablets on the evening of the third day.

Lactation begins about two or three days after labour. It is accompanied by some fullness and tenderness of the breasts, and occasionally by some constitutional disturbance manifested by a rise of temperature of a degree or two.

Changes in the Uterus after Labour

After labour the uterus weighs about 2 pounds; after an interval of a week it weighs 1 pound, and at the end of two months it weighs about 2 ounces. The process which produces the diminution in size and weight of the uterus, together with the remainder of the genital tract, is called involution, but the uterus always remains a little larger than it is in the virgin. The cervix remains soft and patulous, and will admit a finger up to the end of ten days after delivery, although it is undergoing involution simultaneously with the uterus.

Subinvolution is a chronic state of enlargement of the uterus persisting after pregnancy. It is sometimes associated with retention of some of the products of conception or of blood clot and, at other times, with mild degrees of sepsis.

The interior of the uterus is covered by the remains of the decidua. These are thrown off bit by bit in the lochia, leaving the tips of the uterine glands embedded in the uterine muscle. From these the new endometrium is regenerated with the completion of involution.

The placental site is recognizable as an area darker than the remainder of the lining, and in this area are seen small black clots in the mouths of the placental sinuses.

The vagina is smooth and dilated for some days. It quickly undergoes involution, but remains more capacious and less rugose than is the case in nulliparous women. The vulva is lax and sore at first. There may be numerous small splits upon the vestibule and labia. These must be kept clean by frequent baths.

After-pains are irregular painful contractions of the uterus which occur during the first few days after delivery, particularly in multiparæ. They are occasionally due to uterine efforts to expel some retained shreds of blood clot or membrane. If this be suspected ergometrine tablets 0·5 mg. should be given once daily for three days. In most cases after-pains are due merely to powerful uterine contractions despite the fact that the organ is empty. Such patients are relieved by aspirin and codeine.

The lochia is the name applied to the discharge which comes from the uterus after labour. During the first four days the lochial discharge is red and consists of almost pure blood, which oozes from the uterus and from lacerations. The amount of blood soon diminishes, and the discharge becomes pink, then brown, and finally colourless, consisting at this stage mainly of mucus derived from the cervix, together with some leucocytes and epithelial cells. At first a few small clots may be passed, but the continued passage of clots, or the fact that the lochia remains red longer than it should do, points to the probability that membrane and placental tissue is retained inside the uterus. The persistence of some lochial loss for three or four weeks after delivery may be regarded as normal.

The signs of recent delivery are sometimes important from a medico-legal point of view. The signs are only of service during the first eight or ten days following labour. They are as follows: the large, tender breasts; the dark areola around the nipple; the expression of milk and colostrum from the nipples; the flaccid abdominal walls marked with lineæ albicantes and the linea nigra; the enlarged uterus, felt as a round hard mass above the pubes during the first week; the increased length of the uterine cavity as measured by the sound; the cervix patulous; the os externum fissured; the os internum admitting the tip of the finger until the end of the first week; the vagina lax and dilated; the fourchette torn; the lochia red during the first four days, and afterwards changing in character, as mentioned above.

The Management of Childbed

Many of the points in the management of childbed have been mentioned in the preceding pages, and only a few additional items need discussion here.

A sterile pad is worn over the vulva until the lochia ceases.

This pad needs changing after every evacuation of the bladder or bowel, and the subsequent vulval cleansing. The attendant should wear an effective face mask during the performance of these services. Vaginal douches should not be given.

The patient should be visited frequently for six hours after delivery and then at least twice daily during the first week. At these visits the pulse, temperature and the amount and character of the lochial discharge should be noted.

The breasts should be supported in a well-fitting brassiere. They must not be allowed to sag; this is a very important consideration for the mother, who is naturally anxious not to lose her figure. The recovery of the leg and abdominal muscles can be assisted by the mother voluntarily contracting them repeatedly while she is in bed under the supervision of a physiotherapist.

Visitors, except the husband and the patient's mother, should be discouraged until the milk flow is smoothly established. It is usual to allow a patient to get up rather earlier than used to be customary. Patients are allowed to start getting up the day following delivery and daily to increase the time spent out of bed. Frequent baths will assist the healing of episiotomy wounds and will provide relief from discomfort. Maternity patients are mostly allowed to go home about the tenth day. It is wise for her to have domestic help during the next fortnight, for she should not exert herself much until a month after her confinement. Ferrous gluconate will correct anæmia and assist her subsequent convalescence. The resumption of full activities including marital intercourse is preferably delayed until three months after the delivery.

CHAPTER SIXTEEN

The Condition and Care of the Infant after Birth

When the child is born its skin is exposed to many stimuli which are in the main responsible for the establishment of respiratory activity. It is important that the respiratory passages should be clear in order to allow normal gaseous exchanges to take place.

Asphyxia Neonatorum

Occasionally the child is born in a condition of anoxia or severe deficiency of oxygenation of the blood. This will lead to cyanosis and later to shock with peripheral circulatory failure. Head injury during birth will increase the severity of the condition. The non-oxygenation of the blood results from pressure on, or separation of, the placenta before birth, or from pressure on, or undue torsion of, the cord.

Symptoms and Varieties. In the first stage of asphyxia (asphyxia livida) the face is purple and swollen, the muscles retain their tone so that the child is fairly firm, and the cord beats slowly but strongly. The treatment of this condition is to clear the mucus away from the air passages of the child by means of a mucus extractor and to give oxygen through a soft rubber mask. If it is thought that the baby's respiratory centre is depressed by drugs, such as morphine or pethidine given to the mother, an injection of a morphine antagonist into the umbilical vein and squeezed into the baby may promote respiration. Nalorphine hydrobromide 0·5 mg. or levallorphan tartrate 0·25 mg. are effective.

Some children remain persistently blue, despite established respiration. In such cases suspect congenital heart disease.

In the more severe form of asphyxia (asphyxia pallida) the child is in a condition of shock; the limbs are flaccid, the skin is cold, and the heart's action is scarcely perceptible. The essence of the treatment of such cases is to keep the baby still and warm. To do this the cord should at once be divided leaving several inches attached at the umbilicus. The upper air passages must be gently cleared by the use of a mucus extractor. The child is then placed on its side. Warmth is applied by means of an electrically heated blanket if available. Alternatively by hot blankets or by carefully protected hot-water bottles.

Artificial respiration and mouth-to-mouth insufflation have fallen into disuse. Oxygen inhalation (administered by a mask or through a soft nasal catheter passed as far as the nasopharnyx) has replaced the use of carbon dioxide and oxygen mixture. On rare occasions it may be necessary to pass a small tube into the trachea when it is possible to maintain adequate oxygenation in the absence of respiratory movement. As an alternative intragastric oxygen given through a small double rubber tube has been advocated, but care must be taken not to exceed 300 ml. of oxygen per minute.

Meconium

During the first few days after birth, and often during birth if the breech presents, meconium is discharged from the rectum. It is a thick dark green fluid consisting of bile mixed with intestinal mucus.

The Vernix Caseosa

This is the greasy material consisting of epithelium and sebaceous secretion, which covers the skin of the child at birth.

Urine

An abundance of urine of low specific gravity is secreted immediately after birth; it nearly always contains albumin at first.

The Breasts of the Infant

These sometimes swell and yield a milky fluid. This breast acitivity results from the baby's withdrawal from the mother's œstrogen. It may be necessary to give the baby stilbœstrol 0·1 mg. by mouth. In no circumstances should the breasts be squeezed. On rare occasions a breast abscess may develop and this should be treated with antibiotics.

Slight jaundice often occurs during the first week owing to hæmolytic changes in the blood. It passes off in a day or two. Severe jaundice, icterus gravis neonatorum, is the commonest manifestation of erythroblastosis consequent upon immunization of a rhesus negative mother by her rhesus positive infant. This will have been anticipated by good antenatal care. The condition has been previously discussed.

The child loses weight during the first three or four days after birth, but quickly regains it.

Care of the Infant

After birth a healthy child should be washed with soap and warm water, and the vernix caseosa should be softened by olive oil and removed. The umbilical cord is kept dry with chlorhexidine cord powder, and may be covered with a gauze dressing held in place with a crepe bandage. The child should be warmly and lightly clothed, and should be washed all over once daily.

Care of the Premature Infant

This should preferably be the responsibility of a pædiatrician with trained nursing staff and in a special nursery. It is important not to start feeding a premature baby too early, since the food very easily enters the respiratory passages. Many premature babies are best nursed in an incubator with temperature and humidity control, but the percentage of oxygen must not be allowed to exceed 40 per cent. Antibiotics are given to prevent infection and strict barrier nursing is recommended.

CHAPTER SEVENTEEN

Lactation

When the mother has rested for about twelve hours the baby may be put to the breast, for the stimulus of the act of suckling favours uterine contraction and breast activity. Until the milk secretion is fully established, the child should be put to the breast at eight-hourly intervals. If, during this period, it cries from hunger, it should be given from time to time a teaspoonful of boiled water. When lactation has become well established, the child should be nursed regularly every three hours at first. The intervals between the times of suckling may be increased, so that the feeds are given four-hourly, once the child's weight is 6½ pounds or more. It may be necessary to give a feed in the night during the first six weeks of life, although many babies will drop the feed before leaving hospital. Only milk should be given during the first three months, after which a little veal or chicken broth may be introduced. Cereals should be given in very limited amounts as they tend to cause obesity and indigestion if given too early.

Many mothers will wish to bottle-feed their infants and provided the birth weight is over 6½ pounds, there is no objection to this. It is much easier to inhibit breast activity at birth, before lactation has become established. Serious maternal disease such as tuberculosis, diabetes mellitus and syphilis are a contra-indication to breast feeding. If the nipples become severely cracked or the breast infected, lactation should be inhibited.

Milk consists of fat globules surrounded by albuminous envelopes, and suspended in a fluid containing protein, lactose and salts. The fat globules are derived from the cells lining the glandular alveoli of the breasts, these cells having broken down and discharged their fatty contents. For a short time after labour the secretion of the breasts contains large granular corpuscles (colostrum corpuscles). This early milk resembles blood plasma. Chemically, human milk contains 3·5 per cent. of fat, from 6 to 7 per cent. of lactose and about 2 per cent. of caseinogen and lactalbumin. The solids amount to about 12 per cent. and the salts to 0·2 per cent. In reaction it is alkaline; it is also sterile, and its specific gravity about 1030.

Artificial Feeding

Cow's milk forms the basis of artificial feeding. It differs from human milk in that it contains about the same proportion of fat, but less sugar and more protein, the proportions being roughly: water, 88 per cent.; fat, sugar and protein, each 4 per cent. There is proportionately more caseinogen than lactalbumin, and the disadvantage of cow's milk is that the caseinogen forms large tough curds in the child's stomach. This is largely overcome by diluting the cow's milk but then sugar will have to be added, so as to reach an approximation to the constitution of human milk. One way of modifying cow's milk to breast standard is as follows: take ½ pint cow's milk, add one heaped tablespoonful of lactose and 1 ounce of thick dairy cream. Make up with water to a total volume of 1 pint, and add 10 grains of sodium citrate to render the curd more flocculent.

All milk mixtures should be sterilized before being given to the infant. This may be done by immersing the milk in a bottle in boiling water for forty minutes. Or the milk may be brought to boiling-point for three minutes, and then rapidly cooled.

The more usual practice, and one which suffices for most practical purposes, is to prepare the milk for the day. Bring it to the boil, stirring all the time, and then cool it quickly by putting the containing vessel into cold water. From this supply the amount required for each feed is taken and warmed up to body temperature.

It is now common practice to use dried cow's milk to which sugar and vitamins have been added. One fluid ounce of boiled water is added to each measure-full of dried milk. Half the infant's weight in pounds is equal to the feed in fluid ounces, e.g. if the infant weighs 10 pounds, it will require a feed of 5 fluid ounces. Half cream milk is given until the infant is 8 pounds and full cream thereafter.

The bottles and teats used for artificial feeding must be sterilized regularly, and the feeds given at regular hours. If the bottles and teats are washed in running water and then left immersed in a solution of Milton between feeds, this is usually adequate and avoids the necessity for boiling equipment.

The healthy child sleeps between feeds. Restlessness and abnormal conditions of the child's stools generally point to some defect in the method of feeding.

Disorders of Lactation and of the Breasts

When it is necessary to suppress lactation the breasts themselves are supported and left alone. If they get unbearably full, some of the excess secretion may be massaged off. Stilbœstrol in 5 mg. tablets is given thrice daily for three days, 2 mg. thrice daily for three days and then 1 mg. thrice daily for three days. There should be a moderate restriction of the fluid intake and occasional morning saline aperients may be helpful. Nothing more drastic is necessary.

A deficiency of milk is often seen in the elderly mother or following a long labour complicated by infection. Lactation may be encouraged by giving a more nutritious diet to the mother, by more fluid (not necessarily milk), by lengthening the intervals between feeds and by the avoidance of excitement or fatigue. Lactagol in milk, if taken by the mother, may cause thirst, increase fluid intake and improve the milk flow. The lactogenic hormone from the pituitary gland is being tried and small doses of Lugol's iodine solution in water are useful.

Cracked or Sore Nipples. These are a very serious menace. They cause great pain to the mother, and may be followed by breast abscess. Cracking is most likely to occur if the baby is not put far enough on to the nipple and is allowed to chew. If the nipples are flat and the skin is thin, cracking is likely to occur. Stimulation of the nipples and the application of a lanolin cream during the last eight weeks of pregnancy will go far to preventing cracking. When suckling is taking place, the nipples must be carefully washed and dried after each feed. If cracks develop, feeding from the affected breast must be stopped for forty-eight hours and the cracks dressed with Massie nipple cream or sterile lanolin. When suckling is resumed, a nipple shield should be employed for the first day. If the cracks persist or reopen, it is probably safest to stop breast feeding and substitute artificial feeds.

Depressed Nipples. These should be treated during pregnancy by pulling them out with the fingers and by wearing a Waller nipple shield beneath the brassiere. If incurable, the child may be able to suck through a nipple shield, but it is probable that attempts at breast-feeding will have to be abandoned.

Mammary Inflammation and Abscess. Infection may travel into the substance of the breast from a cracked nipple; or blockage of a milk duct results in damming back of the secretion, and infection by *Staphylococcus aureus* may follow. The source of this infection is commonly the upper respiratory passages of the baby, who acquires it from medical or nursing attendants, or even the mother herself. Occasionally, breast abscesses arising in this manner may assume epidemic proportions in hospital practice.

Symptoms. Some part of the breast becomes red, tender, swollen and hard. This may occur after the patient has left the hospital and perhaps three weeks after the start of lactation.

The temperature rises, and the pulse rate is increased. Sometimes, as the result of repeated hot fomentations and massage of the affected part of the breast towards the nipple, the trouble settles down particularly if antibiotics such as tetracycline (Achromycin) or chlortetracycline (Aureomycin) are given. The infant should be taken off the breast and lactation inhibited. If treatment has not been given or if the staphylococcus is resistant to the antibiotic therapy the condition may progress to suppuration and the formation of an abscess. The swelling is now fluctuant and extremely tender. Aspiration through a wide bore needle is sometimes beneficial, but it may be necessary to make a small radial incision over the abscess under general anæsthesia. A finger should explore the cavity and break down any septa which may interfere with the free drainage of any loculi. One or more drainage tubes should be inserted as is found necessary, and repeated hot fomentations applied. Even so, these breast abscesses tend to spread, and any patient with this complaint can count herself fortunate if no second operation for the incision and drainage of some outlying abscess becomes necessary.

The above description applies to the usual type of breast abscess in which the glandular and inter-glandular tissues of the breast itself have become infected. Rarely, it is the connective tissue deep to the gland which is involved. In such cases, in addition to the constitutional symptoms, the breast is lifted forward by the pus, and severe, deep-seated pain is felt. The abscess is apt to track widely in various directions, and requires extensive opening and draining.

CHAPTER EIGHTEEN

Malpresentations

Causes

The following conditions can give rise to each and every kind of malpresentation and so it is unnecessary to memorize a list of causes for each particular one malpresentation. The following general list will suffice instead:

1. Contracted pelvis.
2. Pelvic tumour including ovarian cyst and uterine fibroids.
3. Placenta prævia.
4. Multiple pregnancy.
5. Hydramnios.
6. Dead or premature infants.
7. Extreme uterine obliquity including lax abdominal wall.

I. FACE PRESENTATIONS

Frequency

1 in 200 labours.

Causes

The commonest reason for this malpresentation is an increase in tone of the extensor muscles of the baby's neck. In most instances the baby is normal in every other respect and the head assumes a normal flexed attitude within one week of birth. The causes given above are occasionally found and in addition the anencephalic monster, when head downwards, will present as a face.

Positions

The fœtal chin is used as the denominator. Mento-anterior positions are more common and more favourable than mentoposterior positions.

1. *Right Mentoposterior.* This is produced from a left occipito-anterior (first position of the vertex) by complete extension. The long diameter of the face (frontomental) lies in the right oblique diameter of the pelvis. The fœtal back is to the mother's left side.

2. *Left Mentoposterior.* Similarly produced by complete extension of a second vertex.

3. *Left Mento-anterior.* This is the commonest position of the face. It results from a right occipitoposterior vertex having become fully extended.

Diagnosis

An accurate diagnosis is rarely made on abdominal palpation. The head rarely engages in the pelvic brim until the onset of labour. For this reason the patient is often submitted to an investigation for disproportion, and a straight X-ray of the abdomen will reveal the diagnosis. When the cervix is sufficiently dilated to allow two fingers an accurate clinical diagnosis can be made. The bridge of the fœtal nose lies in the centre of the cervical os. On either side the supra-orbital ridges will be felt and the mobile frontal suture extending towards the anterior fontanelle. The hard alveolar margin of the mouth may also be felt.

Management

It is not possible to correct this malpresentation by abdominal manipulation. The spontaneous onset of labour should be awaited and labour is not usually prolonged. As the cervix dilates the baby's head usually descends and rotates to bring the chin towards the front. The presenting diameter is the submentobregmatic ($3\frac{3}{4}$ inches), which is similar to the fully flexed vertex. The relative rigidity of the face, however, prevents moulding so that the fœtal head is slightly larger than the moulded vertex. Nevertheless, spontaneous delivery can usually be awaited. Because the head is often high in early labour, a vaginal examination is especially necessary at the time of rupture of the membranes to exclude prolapse of the cord.

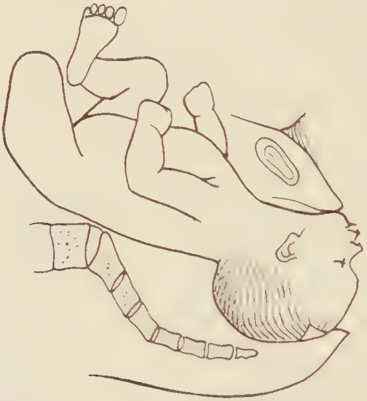


FIG. 25. Face Presentation: The head is hyperextended and the chin has rotated towards the symphysis pubis.

Mechanism of Delivery. The head is fully extended and the chin is the leading point of the fœtus. As this meets the resistance of the pelvic floor the head is rotated to bring the chin to the front (internal rotation). When the chin has passed the subpubic arch, the head is then born by flexion; forehead, vertex and occiput successively passing the perineum. Once the head is born the untwisting of the neck causes restitution and this is followed by external rotation in a manner similar to normal vertex delivery.

Persistent Mentoposterior. Spontaneous face delivery can occur only if the chin rotates to the front and this usually happens late in the second stage and with the face on the perineum. Failure of rotation may result in a persistent mentoposterior position and complete obstruction. In these cases it will be necessary, under general anæsthesia, to rotate the head to the anterior position either with the hand or Kjelland's obstetric forceps before effecting extraction. This may prove a difficult delivery and should be left in the hands of the expert. Failure to rotate may necessitate a Cæsarean section or, if the fœtus is dead, craniotomy.

Changes of the Head in Face Presentation. The occipitofrontal diameter is much increased. The caput succedaneum is on the face and produces considerable disfigurement from œdema of the lips and eyelids.

2. BROW PRESENTATION

Frequency

1 in 200 labours.

Causes

The causes of brow presentation are similar to those of face. The presenting diameter is the mentovertex ($5\frac{1}{2}$ inches) which renders delivery as a brow impossible. The presentation must be changed before vaginal delivery can be effected.

Primary Brow

This occurs before the onset of labour when the fœtal head is still above the pelvic brim. The head is unstable and may undergo flexion to a vertex or extension to a face. In many instances a short labour will result in extension to a face and spontaneous delivery. If the head remains above the pelvic brim a Cæsarean section is performed for obstructed labour.

Secondary Brow

This presentation develops during the course of labour.

In most instances the fœtal head enters the pelvic brim as a vertex in an occipitoposterior position. Having descended to the mid-cavity, which is the most spacious part of the pelvis, the head undergoes partial extension and becomes a brow presentation. In these cases correction is delayed until the cervix is fully dilated. A general anæsthetic is then given and the head is manually flexed and then rotated to a vertex occipito-anterior. The expert may prefer to use Kielland's forceps to perform this manipulation. Conversion of the brow within the pelvic cavity to a face presentation is usually found more difficult. If the fœtus is dead and manipulations prove difficult, craniotomy may be necessary.

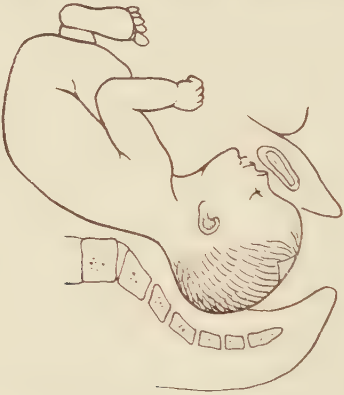


Fig. 26. Brow Presentation. The head has entered the pelvic brim as a vertex occipito-posterior and then undergone partial extension to a brow.

3. COMPOUND PRESENTATIONS

This is a combination of presenting parts. The commonest is the head and the hand. Spontaneous expulsion may occur, but in many instances replacement of the hand under general anæsthesia will be necessary at full dilatation. Because of the large, irregular presenting part labour tends to be prolonged and there is a high incidence of cord prolapse.

4. BREECH PRESENTATIONS

Frequency

The incidence of breech delivery largely depends upon whether the malpresentation is corrected by external cephalic version. The incidence in Great Britain where this manipulation is commonly performed is about 3 per cent. of all deliveries.

Varieties

Frank Breech. Here the legs are extended at the knee and fully flexed at the hip. It is the type which is most commonly seen in both the primiparous and multiparous patient. The buttocks provide a smooth presenting part, which serves as a good cervical dilator. The risk of cord prolapse is, therefore, slight.

Complete Breech. This is usually seen in the multiparous patient. The legs are flexed at both the knee and the hip. The irregular presenting part is a poor cervical dilator and promotes a high incidence of cord prolapse.

Footling Breech. Partial extension of the baby's hip will result in presentation of the foot. The incidence of cord prolapse is high and there is a risk of expulsion of the trunk before full dilatation has been reached.

Half Breech. This is the outcome of an internal podalic version. In most instances one leg is extended and the other has been pulled down by the obstetrician into the vagina. Traction on the leg may result in respiratory movement *in utero* with the danger of atelectasis, and premature expulsion of the fœtus before full dilatation of the cervix.

Cause

In most instances no cause can be found for breech presentation, which probably occurs by chance. The buttocks become fixed in the pelvic brim and the fœtus is unable to kick itself round into a normal vertex presentation.

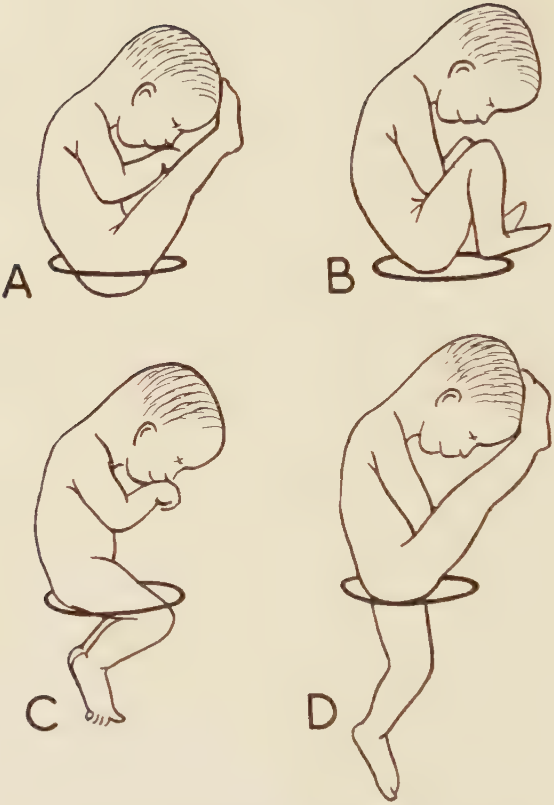


FIG. 27. Types of Breech Presentation.

A. Frank Breech. The buttocks fit the cervix which dilates easily. There is little risk of cord prolapse.

B. Complete Breech. The irregular presenting part is a poor cervical dilator.

C. Footling Breech. The incidence of cord prolapse is high. The patient is likely to bear down before full cervical dilatation.

D. Half Breech. This follows internal podalic version for transverse lie.

Diagnosis

The fœtal head which is smooth, hard, round and mobile is felt at the uterine fundus. The characteristic physical sign of external ballottement of the fœtal head is diagnostic of breech presentation. In early labour when the cervix has dilated, the breech may be palpated on internal examination and the characteristic spines on the back of the sacrum, the tip of the fœtal coccyx and the presence of a foot with its heel prominence may be diagnostic.

Position of the Breech

The sacrum is used as the denominator and in most instances will be found to be directed laterally. Occasionally, if the sacrum is directed posteriorly, this will result in delay during labour. It is still traditional to describe four oblique positions thus:

- (*a*) Dorso-anterior
  1. Left Sacro-anterior, sacrum directed towards the left pectineal eminence (most common position).
  2. Right Sacro-anterior, sacrum directed towards the right pectineal eminence.
- (*b*) Dorso-posterior
  3. Right Sacroposterior, sacrum directed towards the right sacro-iliac joint.
  4. Left Sacroposterior, sacrum directed towards the left sacro-iliac joint.

In, for instance, the left sacro-anterior position, the back of the child is directed to the mother's left side and forwards. The left buttock, which lies to the front, presents, owing to the inclination of the mother's pelvis.

Mechanism of Delivery

Descent of the breech takes place, and when the leading feature, the anterior buttock, reaches the pelvic floor, it is rotated by that agency from the oblique diameter in which it previously lay into the anteroposterior diameter so that the sacrum is directed laterally. It descends in this position towards the pelvic outlet. While this has been taking place the trunk of the child has gradually been undergoing lateral flexion to accommodate itself to the axis of the pelvis.

At the outlet the anterior buttock fixes in the subpubic arch and the posterior one passes over the perineum. The shoulders follow the internal rotation of the hips and, continuing to advance, the anterior shoulder fixes at the pubes and the posterior shoulder is born by passing over the perineum. The arms are usually born folded across the chest, and are therefore in advance of the shoulders. As the shoulders are born the head enters the pelvic brim and then rotates in the cavity of the pelvis to bring the occiput anterior. The nape of the neck becomes fixed against the subpubic point. The head undergoes flexion on the fœtal trunk and the chin, face and vertex are gradually expelled past the perineum. Very occasionally the occiput fails to rotate forwards, and instead rotates posteriorly into the hollow of the sacrum. This is very unusual and causes serious delay.

This description of the mechanism of delivery refers to spontaneous expulsion, which nowadays is rarely permitted. The manipulations which have contributed to a fall in fœtal mortality will be described.

Risks of Breech Delivery

In the badly managed case there may be a danger of severe maternal trauma. In every breech delivery there is an additional risk to the fœtus. Fœtal death from anoxia may result from prolapse of the cord and delay in delivery of the head following expulsion of the trunk. Fœtal trauma and tearing of the tentorium cerebelli with intracranial hæmorrhage has been a common cause of fœtal death. Other trauma to the fœtus may include: lacerations of the liver; dislocation and fracture of limbs, jaw, clavicle and spinal cord; damage to the brachial plexus and sternomastoid muscle. Even in skilled hands these risks may amount to 5 per cent. In Great

Britain prophylactic external cephalic version is preferred to breech delivery.

External Cephalic Version

This manipulation is performed in the antenatal period after the thirty-second week. Manual pressure is applied through the abdominal wall and the breech is lifted out of the mother's pelvis and the fœtus slowly turned to effect a vertex presentation. Occasionally, general anæsthesia may be necessary to assist the manipulation.

Management of Breech Delivery

Pelvic contraction should be excluded by clinical examination of the pelvis and, if necessary, X-ray pelvimetry. In no circumstances should a breech delivery be permitted in the presence of a contracted pelvis.

Spontaneous onset of labour is awaited. Frequent vaginal examinations are made to exclude prolapse of the cord, to assess the progress of labour and to confirm full dilatation of the cervix. The delivery is usually conducted under pudendal block in the multiparous patient and a combination of local and general anæsthesia in the primiparous patient. When the cervix has become fully dilated the legs are put into lithotomy position and the mother is encouraged to bear down with each contraction. An episiotomy is performed under local analgesia and spontaneous expulsion of the buttocks is awaited. The mother is then assisted with the remainder of the delivery. Gentle traction on the legs will deliver the trunk. The shoulders are delivered by rotation and traction in a backwards and downwards direction (Lövset's manœuvre). Pressure on the cord causes a spasm of the umbilical arteries so that pulsations may be feeble or absent. This is not an indication to hasten delivery. The fœtal head is brought into the pelvic cavity by allowing the trunk to hang downwards over the perineum. In most instances, the aftercoming head is then most safely delivered by the application of forceps.

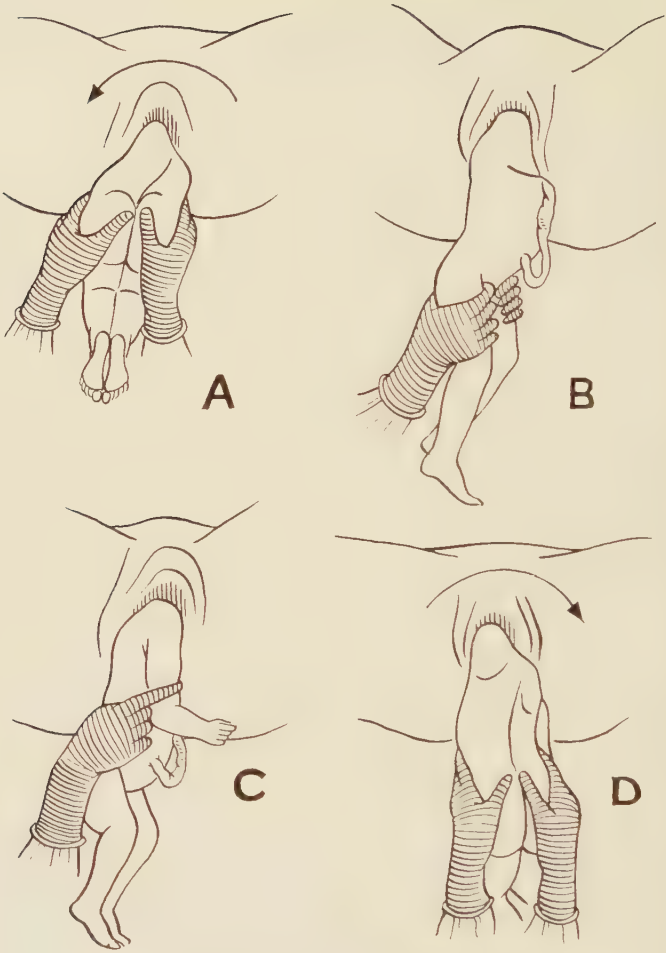


FIG. 28. Lövset's Manœuvre.

A. The infant's back is to the mother's left. The thighs are grasped and traction is applied in the axis of the birth canal and at the same time the infant is rotated anti-clockwise in the direction of the arrow.
B. The original posterior shoulder has been delivered, but the forearm remains within the vagina.
C. The arm is released from the vagina.
D. The infant is rotated in a clockwise direction keeping the back uppermost and the other shoulder and arm delivered in a like manner.

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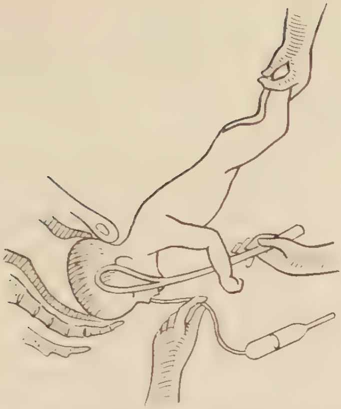

Fig. 29. Delivery of the Head. An assistant grasps the infant by its ankles, the forceps are applied and the head delivered slowly by intermittent traction. The upper respiratory passages are aspirated and respiration established.

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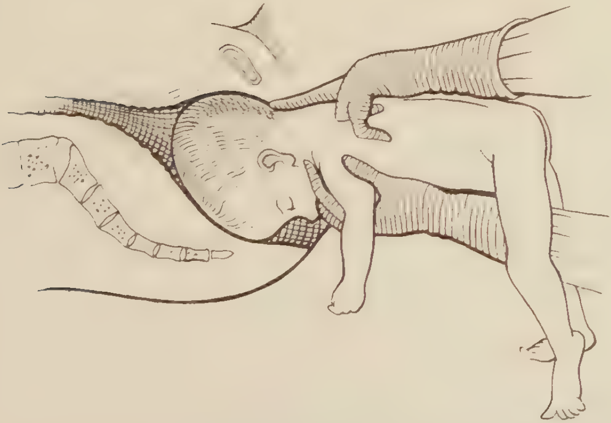

Fig. 30. Mauriceau-Smellie-Veit Manœuvre.

The trunk is supported by the forearm and the head is slowly delivered by jaw and shoulder traction.

The forceps blades act as a protective cage to the fœtal head and enable the upper respiratory tract to be fully aspirated before the delivery is complete. The midwife will prefer to use jaw and shoulder traction (Mauriceau-Smellie-Veit manœuvre), but this method in difficult cases may result in damage to the baby's mouth and jaw, and traction on to the brachial plexus and sternomastoid muscle. An anæsthetist should always be present so that general anæsthesia can be induced without delay should complications arise.

Complications

Many complications arise from bad obstetric management and attempted breech delivery in the presence of disproportion.

Extended Legs. This is no longer considered a complication. The splinting action of the legs will not prevent spontaneous expulsion of the buttocks. Delay of more than thirty minutes may be overcome by a deep episiotomy and anterior groin traction applied with the forefinger during a uterine contraction. If this is not possible and the buttocks fail to descend on to the perineum, disproportion should be suspected and delivery by Cæsarean section is advised. Previously it was the custom to push the breech out of the pelvis and to pull down a foot under general anæsthesia, but this was followed by even greater difficulty in delivering the shoulders and head.

Upward Displacement of the Arms. It was common practice to deliver the arms by inserting the hand into the vagina alongside the fœtal trunk. This often caused severe maternal damage and if the arms were extended the manipulation proved extremely difficult. Lövset's manœuvre will always deliver the shoulders and the arms can then be easily hooked down. Traction need no longer be feared since Lövset's manœuvre works more efficiently if the arms are extended.

Difficult Delivery of the Head. If the head fails to enter the pelvic brim, unrecognized pelvic contraction or hydrocephalus is usually responsible. Great difficulty will be encountered in completing the delivery and the infant will almost certainly perish.

Occasionally the patient has been allowed to bear down before full dilatation is confirmed by vaginal examination. The trunk is expelled and the head retained by the cervix around the neck. Heavy traction and even cervical incisions may be necessary to effect delivery.

Fœtal Morbidity

It is suggested that in the past many fœtal deaths have resulted from inadequate analgesia, difficult induction of general anæsthetic during delivery, failure to perform episiotomy, undue delay in the delivery of the trunk and shoulders, internal methods of delivering arms and legs, excessive extension of the baby's neck, fundal pressure applied to the baby's head resulting in rapid expulsion. The safe delivery of a breech requires experience and skill and should not be entrusted to the occasional obstetrician working in the patient's home.

5. TRANSVERSE AND OBLIQUE LIE

This is most commonly seen in the multiparous patient with a lax uterus and abdomen. As the fœtus increases in size it will in most instances become more stable, but, if the oblique lie persists up to two weeks before the expected onset of delivery, the patient should be admitted to a hospital to await labour. Many obstetricians may prefer at this time to push the head over the pelvic brim, to rupture the membranes artificially and to stimulate the uterus with a continuous intravenous oxytocin drip.

Diagnosis

The uterus is not the usual shape. It is rather triangular, with the apex downwards, and the long base running obliquely across the upper part of the abdomen. The hard head is felt in one or other iliac fossa. On vaginal examination the presenting part is high and the membranes have usually ruptured. Later, the typical shoulder presents. It is pointed and has the spine of the scapula, the clavicle, and the arm radiating from it. In the axilla the ribs can be felt. Late in labour an arm will be prolapsed. The pointed elbow is easily recognizable by the olecranon and the two condyles. The fingers of the hand and the absence of the calcaneum, which forms a characteristic projection on the foot, will aid diagnosis. It is possible to recognize which hand is prolapsed by imagining the hand it would meet in the act of shaking hands.

Outcome of Uncorrected Transverse Lie

Soon after the onset of labour the membranes rupture. Liquor drains from the uterus and the cord may prolapse. Further contractions of the uterus result in a shoulder presentation, which becomes progressively impacted in the pelvic brim. As the cervix dilates the elbow may descend into the vagina, the arm may become extended and the hand may present at the vulva. This will result in complete obstruction. In the primiparous patient the uterus becomes exhausted and suffers from secondary inertia; in the multiparous patient progressive thinning of the uterus results in uterine rupture. Retraction of the placental site causes death of the fœtus.

Management in Labour

In early labour it may be possible to perform an external version and effect a longitudinal lie. This should always be attempted if the membranes are intact. Uterine relaxation may be obtained by general anæsthesia and inhalation of amyl nitrite.

When external version is not possible the best fœtal results can be obtained only if the baby is delivered immediately the diagnosis is made. If the fœtus is alive, the cervix is more than three-quarters dilated and there is still sufficient liquor amnii, internal version under general anæsthetic followed by immediate breech extraction may be successfully performed. If the cervix is less than three-quarters dilated the best fœtal results can be obtained only by an immediate Cæsarean section. In the past bipolar and internal version has been the usual method of delivery and where the cervix has been less than three-quarters dilated spontaneous delivery of the breech has been awaited following the internal version. In these cases, however, stimulation of the fœtus results in aspiration of liquor and atelectasis and the fœtal leg within the vagina causes premature expulsive efforts and delivery of the fœtal trunk before full dilatation.

On rare occasions spontaneous delivery may occur if the fœtus is very small or macerated, but these possibilities are not awaited in practice.

Spontaneous Rectification. The malpresentation is fortunate enough to correct itself to a vertex.

Spontaneous Version. In a similar manner the presentation changes to a breech.

Spontaneous Evolution. This may occur with a very small fœtus and a large pelvis. The uterus forces the shoulder downwards. The presenting shoulder is fixed against the back of the pubis and the rest of the body rotates around this point, the thorax, breech and legs following in succession. Finally, the opposite shoulder and then the head are born.

Spontaneous Expulsion. A very small macerated fœtus may be expelled doubled up so that the back comes first through a large pelvis.

CHAPTER NINETEEN

Multiple Pregnancy

By this is meant the simultaneous development of more than one embryo.

Frequency

Twins occur about once in ninety births; triplets once in 7,000. There is a definite family tendency to multiple pregnancy, which is most likely to occur in the first pregnancy.

Ætiology

1. They may arise from the impregnation of two ova (Binovular Twins). Each fœtus has a separate placenta, chorion and amnion. The two children may be of different sexes.

2. Two embryos may arise from the same ovum (Uniovular Twins). There is only one chorion and one placenta, which is common to the two embryos, but each has its own amnion. Uniovular twins are always of the same sex.

Triplets result from the simultaneous development of two ova, one of which gives rise to two embryos.

Characters of the Children

Twins and triplets are small, and are often born prematurely. Twins are sometimes unequally developed at birth. Occasionally one fœtus dies *in utero*, and may be expelled before the other, or, becoming flattened and mummified, it may be retained and expelled at term with the other child. This difference in the development of the two fœtuses is not dependent on difference in age, but is probably brought about by a difference in placental blood supply.

The mortality of twins is about 1 in 13. It is rare for all the children of triplets to survive.

Diagnosis

The first suspicion of twin pregnancy is usually aroused by finding a pregnant uterus considerably larger than is normal for any particular duration of gestation. There will not be the obvious fluid thrill and free ballottement of hydramnios. On the contrary, the uterus will seem to be over-full of fœtal parts. It may be possible to make a certain diagnosis by the definite palpation of two heads and two backs, and by the hearing of two fœtal hearts beating at different rates. In cases of doubt, an X-ray examination should be made. Occasionally the diagnosis of twins is made only after the first child is born.

Complications during Pregnancy

Discomfort from abdominal distension is common towards the end of pregnancy. Pre-eclampsia occurs in 25 per cent. of twin pregnancies and this is likely to be severe and to occur early in pregnancy in the presence of uniovular twins. Labour usually begins about three weeks before term.

Labour and its Management in Twin Pregnancies

In about 40 per cent. of cases both children present by the head; in about 30 per cent. one is a vertex and the other a breech; in some 8 per cent. both breeches present. As a rule, no difficulty arises in labour, the first child being born normally and the second following within half an hour.

The first and second stages of labour are not usually prolonged as the infants are small. Occasionally the over-distension of the uterus causes infrequent feeble contractions, but this can be overcome by an artificial rupture of the membranes early in labour. Should this inert condition persist into the third stage, there will be a further risk of postpartum hæmorrhage.

After the first child is born its cord should be divided between ligatures. The ligature on the placental end is necessary in case the pregnancy is uniovular, in which case the two fœtal circulations may have such free communication that it would be possible for the second fœtus to bleed through the cut end of the cord of the first. Any malpresentation of the second child should then be corrected by manipulation, through the abdominal wall. This is a most important step in the management of a twin delivery. Fortunately, the manipulation is easy since the relaxed uterus and abdominal wall permits easy turning of the child into the desired longitudinal lie. The membranes of the second amniotic sac are then ruptured and this stimulates further uterine contractions. It is usual for both infants to be born before the placentæ. If for any reason an anæsthetic has been given for the delivery of the first twin, the second twin should always be delivered by breech extraction and this will avoid the difficulties and dangers of high forceps application.

The overdistended uterus predisposes to postpartum hæmorrhage and this risk is minimized by giving ergometrine 0·5 mg. intravenously with the birth of the second twin.

On rare occasions ergometrine is given with the birth of the first of undiagnosed twins. Rapid expulsion of the second twin usually occurs, but a tonic spasm may trap the fœtus and cause uterine rupture. Anæsthesia is quickly induced, amyl nitrite 2 ml. is given as an inhalation and a rapid extraction performed. The membranes are left intact until anæsthesia is induced and in no circumstances should internal version be attempted.

Difficult Cases of Twins and Their Management

1. Occasionally both heads present, and each prevents the other from entering the brim. In such cases push up one head by vaginal manipulation, and push down the other by the abdomen. If the cervix is fully dilated the delivery is completed.

2. A foot or a hand may descend with the head. Push the limb up out of the way.

3. All four feet may present. Pull on the lowest foot and effect a breech extraction. The other feet are pushed out of the way. This complication may occur with conjoined twins.

4. Interlocked twins. This is a very rare complication. It is possible for this to occur when one head descends into the pelvis, and the second head then comes down alongside the neck of the first. The treatment is to push up the second head, and to deliver the first head with forceps; if the second head cannot be pushed up, delivery is best effected by Cæsarean section if the twins are alive and by perforation of the head if the baby is dead.

Interlocking can also occur when the first child is a breech and the second a vertex, if the head of the vertex manages to slip down alongside the neck of the first child, so that its aftercoming head is prevented from advancing. Treatment: try to push the head of the second child up out of the way and complete the delivery of the breech. If this fails the first twin will have died from cord compression and in this case decapitation is necessary. The head remains behind to be delivered after the second twin which usually survives.

5. Conjoined twins. When the two heads lie at the same level in the uterus, conjoined twins should be suspected. Oblique X-rays of the abdomen usually clarify the diagnosis. Since it is now possible in some instances to separate these twins after birth, they should be delivered by classical Cæsarean section about three weeks before term.

Superfœtation

This term is applied to rare cases of multiple pregnancy in which, from considerable difference in the apparent degree of development of the two fœtuses, it is supposed that after partial development of one ovum, a second ovum is fertilized and developed. It is very doubtful if this is possible.

CHAPTER TWENTY

Presentation and Prolapse of the Cord

Definition and Varieties

When the cord descends in front of the presenting part before the membranes rupture, it is called presentation of the cord. If it descends at or just after the time of rupture of the membranes, it is called prolapse of the cord.

Causation

A very long cord will be particularly likely to prolapse. The sudden escape of any large amount of liquor as in hydramnios will also favour the occurrence of this abnormality. Other conditions liable to lead to it are contracted pelvis, malpresentation (especially shoulder) or, rarely, placenta prævia. It may occur during surgical induction especially if the head is not engaged.

Diagnosis

The coils of the prolapsed cord are easily recognizable, particularly if pulsations, synchronous with the fœtal heart, are still present. It could be mistaken for a prolapsed coil of intestine in a case of ruptured uterus, but such a coil would have mesentery attached to it and the mother would be profoundly shocked. Compression of the cord causes slowing of the fœtal heart rate.

Prognosis

Apart from the danger of sepsis being introduced as the result of the requisite manipulations, there is no danger to the mother. There is a serious threat to fœtal life and many infants will die from the cord compression causing irrecoverable anoxia. Others will die from birth trauma following efforts to hasten delivery.

Treatment

Presentation of the Cord. This occurs on rare occasions. The bag of forewaters may to some extent reduce compression of the cord, but nevertheless immediate delivery is advised.

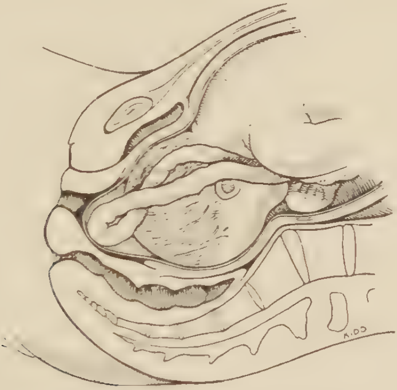

FIG. 31. Presentation of the Cord.

Prolapse of the Cord. If all pulsation in the cord has ceased, thereby indicating that the fœtus is dead, no interference is indicated. Labour is allowed to proceed. If the cord is pulsating treatment must be instituted as soon as possible, and if the degree of cervical dilatation is small, Cæsarean section is indicated and the chances of fœtal survival are good. While preparations are being made in the operating theatre the mother is put into steep Trendelenburg position, a sterile vaginal examination is made and the presenting part is pushed and held high above the brim. This will reduce the risks of cord compression until general anæsthesia is induced and the Cæsarean section may be begun.

If the cervix is almost fully dilated immediate vaginal delivery either by forceps or by breech extraction under general anæsthesia is the treatment of choice. Occasionally in the multigravida a deep episiotomy and fundal pressure with the flat of the hand will be sufficient to complete delivery. When the fœtus is suffering from intra-uterine anoxia it is very susceptible to birth trauma and whichever method of delivery is selected, it should be conducted easily, skilfully and without delay. Until recently it has been taught that attempts should be made to replace the prolapsed cord. This is seldom successful and results in delay and a further threat to the fœtus. The general practitioner will not be able to perform Cæsarean section. An early transfer to hospital is indicated. Intravenous pethidine 100 mg. will reduce the strength of uterine contractions and will permit a prolonged vaginal examination as previously described.

CHAPTER TWENTY-ONE

Prolonged Labour

Causes of Prolonged Labour

These may be divided into two classes:

1. Cases in which the expelling forces—namely the uterus and the accessory muscles—are at fault.
2. Cases in which there is some obstruction to delivery.

In the first class of case we have to deal with one of the most troublesome and tedious of the complications of labour, and one which not infrequently used to lead to the death of the mother from exhaustion, from sepsis introduced during the performance of manipulations deemed necessary for her delivery, and from grave disturbances of metabolism and electrolyte balance. Furthermore, the child may die as the result of these complications and from prolonged pressure during such a labour.

In the second class of case the danger to the mother and the child may be even greater. During early labour the fœtus is protected by the liquor amnii. Before full dilatation is reached, the membranes rupture, the liquor drains away and the placental site undergoes progressive retraction. This may lead to fœtal death. Further uterine contractions in the presence of obstruction leads to excessive thinning of the lower segment. The pulse is raised; the temperature is elevated; the skin and vagina are hot and dry; there is vomiting and dehydration, and the lower segment is tender.

In the primigravida the uterus becomes exhausted and enters a phase of secondary inertia. The dead fœtus undergoes maceration, the head collapses and eventually it may be expelled unless the mother is overwhelmed by exhaustion and sepsis. In the multigravida a similar obstruction soon leads to rupture of the lower segment with early maternal death from hæmorrhage and peritonitis. Even if the mother survives labour the compression of the soft tissues between the fœtal head and bony pelvis may result in a vesico-vaginal fistula. Ill-performed surgical or manipulative interference will increase the risks of uterine rupture.

One of the most important changes in obstetrics in recent years has been towards shortening the first stage of labour. Thirty or perhaps thirty-six hours is about the limit which most obstetricians will allow and the prolonged struggle of a really difficult second stage is almost never permitted. Instead, Cæsarean section is preferred and this, together with antibiotics and blood transfusion, has resulted in a greater fœtal survival and a fall in maternal morbidity.

A. Uterine Inertia

Hypotonic Uterine Inertia

This is a condition in which the contractions of the uterus are feeble and infrequent. The membranes are usually intact, the fœtus is not distressed and the mother is able to maintain normal nutrition and sleep with the aid of sedatives. The uterus may be stimulated by emptying the bowel with an enema and by rupturing the membranes. If this fails, in hospital practice it is the custom to give a continuous intravenous oxytocin drip. Labour then progresses normally. This type of labour may be associated with an overdistended uterus, as in twins and hydramnios.

Inco-ordinate Uterine Action

This is a condition in which the uterus contracts vigorously, but the cervix dilates very slowly. The pains are severe and felt mainly over the sacral region. The mother is greatly distressed and heavy dosage of analgesics is necessary in an attempt to effect relief from pain. Vomiting and gaseous distension of the bowel is common. The cervix becomes taken up, but the os feels tight, as if lined with wire, and dilates very slowly. When labour has continued for more than thirty-six hours spontaneous splitting of the cervix is common and this may eventually permit delivery. This condition is almost invariably associated with the occipitoposterior position and it is the author's opinion that this malposition is responsible for changing the normal uterine axis pressure. With each contraction the fœtal head is pushed downwards and forwards against the back of the pubis instead of directly downwards on to the cervix. When the mother has her second confinement the fœtal head undergoes spontaneous rotation to the occipito-anterior position early in the first stage and labour is rapidly progressive. So-called inco-ordinate uterine action is a problem of the primigravida. If the occipito-posterior position persists into the second stage of labour, early rotation and forceps extraction is advised.

Even though the labour is prolonged and distressing it is usual to delay Cæsarean section for 36 to 48 hours. During this time heavy pethidine and morphine analgesia is given. Electrolyte balance and adequate calorie intake is maintained with intravenous glucose-saline solution. Forceps delivery may be attempted by the expert just before full dilatation, but cases occurring in domiciliary practice should be transferred to hospital within 24 hours. Towards the end of the first stage of labour a continuous epidural or caudal block may hasten cervical dilatation, provide complete relief from pain and eliminate the necessity for analgesic drugs, which are likely to depress the baby's respiratory centre after birth.

Secondary Inertia

This occurs in the primigravida and results from unrelieved obstructed labour. The condition should not be confused with the relatively unimportant hypotonic uterine inertia.

B. Obstructed Labour

The causes of obstructed labour may be divided into maternal and fœtal.

(*a*) *Maternal:*

(1) Various forms of contracted pelvis.
(2) Tumours of the bony pelvis, or of the pelvic organs. These are rare.
(3) Abnormal conditions of the maternal soft parts.
(4) Displacements of the uterus.

(*b*) *Fœtal:*

(1) Abnormal presentation: such conditions as brow and shoulder presentations, locked twins, impacted breech, and persistent mentoposterior face have already been discussed.
(2) Abnormal size: hydrocephalus, monsters, tumours. Most of the above contitions need further discussion, and will be numbered as in the above summary.

MATERNAL CAUSES

I. OBSTRUCTED LABOUR DUE TO CONTRACTED PELVIS

Chief Varieties of Contracted Pelvis

These are most conveniently considered in two groups: the common types and the rare types.

The following are the common types:

1. *Simple Flat Pelvis.* This is the result of poor development. The effect is to bring the whole of the sacrum nearer to the pubes than is normal, but this approximation is most marked in the upper part, so that the diameter of greatest contraction is the anteroposterior of the brim. The other anteroposterior diameters are diminished to a lesser degree. The main difficulty in labour is therefore experienced in the head

coming through the anteroposterior diameter of the brim. A lesser degree of difficulty is encountered as the head descends further.

In the classification of pelvic shape as disclosed by radiology this simple flat pelvis would correspond to a small platypelloid pelvis. Be it noted that these names—platypelloid, android, anthropoid and gynæcoid—describe the shape of the pelvic brim irrespective of size. They are not the names of varieties of contracted pelvis.

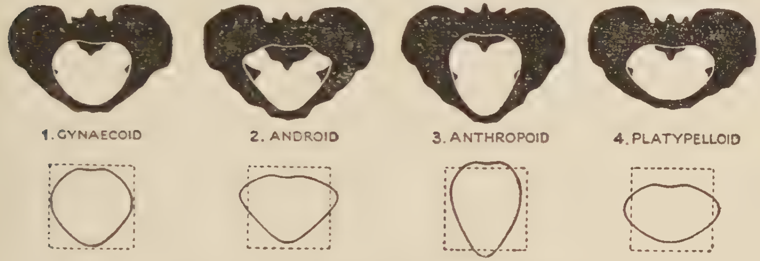

Fig. 32. The Four Main Types of Pelvis.

2. *Rickety Flat Pelvis.* This deformity occurs in early childhood. The weight of the trunk, acting through the vertebral column, pushes the promontory of the softened sacrum towards the middle of the pelvic brim. With this forward movement of the upper part of the sacrum the lower part tries to tilt backwards, for the sacrum rotates through a horizontal axis running through the sacro-iliac joints. However, the coccyx and lower sacral vertebræ are tethered by the sacrosciatic ligaments. Consequently there is a sharp forward angulation at the third sacral vertebra and the outlet is only slightly enlarged above normal. This angulation increases the size of the pelvic cavity. The main deformity, however, is at the level of the pelvic brim and if the fœtal head can negotiate the brim the rest of the delivery is relatively easy.

3. *Generally Contracted Pelvis.* This may be regarded as a normal pelvis in miniature. If anything, the contraction is

apt to be more marked at the outlet than at the brim, and consequently the difficulty is likely to increase as the head descends. This type of pelvis is due to poor development and corresponds to a small "gynæcoid" pelvis. It is often seen in the woman of short stature. The baby is often small and labour may be completed without difficulty.

4. *Generally Contracted and Flat Pelvis.* This is a generally contracted pelvis in which the promontory has also sagged towards the symphysis consequent upon bony softening due to rickets.

5. *Minor Transverse Contraction.* Among the common pelvic deformities resulting from an inherent fault in the bony development is narrowing in the transverse diameter. This is most marked at the outlet. It results in approximation of the ischial tuberosities and the production of a slight degree of "funnel" deformity. In addition, the pelvic brim is somewhat triangular in shape and the posterior part of the pelvis is diminished in size, as evidenced by a diminution in the anteroposterior measurement of the sacrosciatic foramen, as revealed in a lateral X-ray. In fact, this minor funnel pelvis corresponds to a small "android" pelvis. The main effect of this type of pelvis is to give rise to some difficulty at the outlet, perhaps requiring forceps extraction to overcome it.

The *rare types of contracted pelvis* can rather be regarded as curiosities. They generally require Cæsarean section. These are:

1. *The Kyphotic Pelvis.* The outlet is here very contracted, the whole pelvis funnel-shaped, narrowing downwards. This deformity is due to a lumbar kyphosis, usually the result of spinal tuberculosis.

2. *Robert's Transversely Contracted Pelvis.* Absence of the lateral masses of the sacrum leads to the two innominate bones being much nearer each other than is normal. This will obviously result in great narrowing of all the transverse diameters of the pelvis.

3. *Nägele's Obliquely Contracted Pelvis.* One sacral lateral mass is missing, and therefore one innominate bone is much nearer the midline than it should be.

4. *The Spondylolisthetic Pelvis.* The last lumbar vertebra is dislocated forwards in front of the sacral promontory, so as greatly to reduce the anteroposterior diameter of the brim.

5. *The Osteomalacic Pelvis.* This is almost unknown in Britain, but is common in certain foreign countries such as China. The true pelvis is distorted, so that only a Y-shaped canal remains. The deformity results from severe and prolonged malnutrition and vitamin D deficiency.

The Diagnosis of Contracted Pelvis

This is made from:

(*a*) *The History and General Examination.* There may be a history of rickets or of previous obstetric difficulties. The former labours may have been dealt with by Cæsarean section, or by the induction of premature labour. The small stature of some women will arouse suspicion, while any deformities of the limbs or spine will at once suggest deformity of the pelvis.

(*b*) *The Pelvic Measurements.* The internal measurements have already been described. It should be remembered that external measurements are of no value and may be thoroughly misleading. The internal measurements, if taken by one experienced in pelvic examination, give reliable information as to the real size of the bony birth canal, provided that the patient has been tolerant of examination. Although a pelvis may be normal in size, it should be in all cases compared with the size of the fœtal head. In fact, at the routine prenatal examination at the thirty-sixth week of pregnancy and at each of the subsequent examinations, the two main points to be determined are: (1) How does the child lie? and (2) How does the fœtal head fit into the pelvis? If the doctor in charge of a confinement case is not sure of his findings with regard to the size of the pelvis and the lie of the fœtus he can often receive assistance from an X-ray examination.

Influence of Contracted Pelvis on Pregnancy and Labour

During early pregnancy the projecting promontory of any of the varieties of flat pelvis may hold down the fundus of a retroverted gravid uterus. By preventing the spontaneous ascent which is the usual occurrence in such cases, incarceration of the retroverted gravid uterus ensues.

In the later weeks of pregnancy the small pelvis may prevent the head engaging in the pelvic brim. This may be associated with a malpresentation, and the uterus may fall forward into extreme anteflexion, so that the abdomen is pendulous.

During labour the difficulty, of course, varies with the degree of contraction and the size and position of the fœtal head. The membranes form a sausage-shaped protrusion. The pains may be weak in the early stages and lead to slow cervical dilatation. Later, the pains may become strong so that in minor degrees of contraction they suffice to effect delivery. In doing so they may adversely affect the mother by exhausting her, or by causing severe pressure effects on the soft parts. Contusions, perhaps sloughing, and even fistula formation may result.

With regard to the child, stillbirth may result from prolapse of the cord, placental insufficiency or from head injury. Such injuries which are due to the great pressure on the head may take the form of fractures, tentorial tears and intracranial hæmorrhage. Lesser injuries which may not cause the death of the fœtus, but which may lead to its being born in a state of anoxia, are severe moulding with over-lapping of the bones, and contusions of the scalp and brain tissue.

The Mechanism of Delivery in Contracted Pelvis

If the pelvis is flat—i.e. with a diminished anteroposterior diameter of the brim—the head engages with its long axis in the transverse diameter of the brim; it then moves towards that side of the pelvis where the occiput is situated, so that the narrower bitemporal diameter is the one that has to squeeze past the narrow part of the brim. Slight extension of the head also brings the wide biparietal diameter nearer to the occipital pole. The head is tilted towards the anterior shoulder (anterior asynclitism) so that the frontal and parietal bones, which lie anteriorly, slip down past the symphysis before the posteriorly placed frontal and parietal bones are forced past the sacral promontory. The diameter of engagement under these circumstances is the super-subparietal diameter, 3½ inches.

In cases of generally contracted pelvis in which it is possible for delivery to be secured, the birth takes place by the usual mechanisms, with the addition of extra strong flexion of the head.

Flattening of the sacrum associated with prominent ischial spines leads to midcavity arrest of the head in the transverse position. This usually necessitates rotation and forceps extraction at full dilatation.

On rare occasions the pelvis is funnel shaped, but in these cases the head is arrested high in the pelvis and not at the outlet. The expert may in carefully selected cases attempt forceps delivery and if this is not achieved with reasonable ease will proceed immediately to Cæsarean section. If the head is visible at the vulva severe pelvic outlet contraction can be safely excluded.

Management of Cases of Contracted Pelvis

In the vast majority of cases of small pelvis the degree of contraction is comparatively slight. It can also be assumed with safety that but for a few cases, if the head can pass the brim it can also go through the rest of the pelvis. Therefore, it is with the brim that we are chiefly concerned. Furthermore, it is principally in the anteroposterior diameter of the brim (the true conjugate) that we are interested. If 4¼ inches be taken as the normal, the first ½ inch contraction—i.e. true conjugate, 4¼ to 3¾—usually permits spontaneous delivery, provided that the head is of normal size.

It is not the exact size of the pelvis that matters. Rather it is the relation between the fœtal head and the pelvis which is of importance. As the result of antenatal care cases can be divided into (1) a great majority in which no mechanical difficulty need be anticipated on the grounds of disproportion; (2) a very few in which the true conjugate is usually less than 3¼ inches, and in whom natural delivery would appear to be quite impossible and who will be delivered by Cæsarean section before the onset of labour; and (3) a small group of borderline cases in which the obstetrician is doubtful as to the outcome of labour. Such cases are allowed to go into labour spontaneously and the effects of uterine contractions closely observed. In many instances the head will undergo marked moulding, the resistance of the soft tissues will be overcome and the uterine contractions will effect full dilatation of the cervix. Forceps extraction may be necessary to complete delivery. If, however, the cervix has reached half dilatation with the membranes ruptured and the head has not engaged, Cæsarean section is performed. In no circumstances should attempts be made to effect a forceps delivery from the level of the pelvic brim. Unfortunately, on many occasions, fœtal distress develops early in labour and Cæsarean section is performed before absolute disproportion has been proved.

In the past surgical induction was frequently performed in an effort to get a smaller baby. Premature induction of labour is always attended by added risks to the baby, including retraction of the placental site, infection of the liquor and prolapse of the umbilical cord, and these risks outweigh the advantage of a smaller baby.

It must be appreciated that nowadays with antibiotics we are in a position to undertake Cæsarean section despite a risk of sepsis which, a few years ago, would have made this an unjustifiable procedure. It is almost unbelievable that in these days there would be encountered a case in which the amount and character of the previous interference, the way and the conditions in which this was carried out and perhaps the evidence of septic infection already present, would render Cæsarean section too dangerous a procedure. In such cases an attempt may be made at forceps delivery; if this fails, or if the child is dead, perforation and slow extraction by a cranioclast with weight traction would probably still be employed. It is doubtful if the more complicated methods of reducing the size of a dead fœtus are ever justified nowadays. It is probably safer to deliver by Cæsarean section despite its obvious disadvantages.

In other cases, when the patient is first seen, it is clear that no amount of moulding will succeed in letting the head pass the brim. Cæsarean section by the lower segment route is the treatment. And in cases where the true conjugate is less than 2¼ inches, it must be realized that even the complicated operation for reducing the size of the head will not enable delivery by the vagina to be secured, and Cæsarean section has to be done.

2. OBSTRUCTED LABOUR DUE TO TUMOURS OF THE BONY PELVIS OR OF THE PELVIC ORGANS

Exostoses, malignant growths of the sacrum and other pelvic bones, may very rarely encroach on the pelvic cavity and cause obstruction to delivery. Cæsarean section will be required.

Fibroids, if seated in the upper part of the uterus, cause no trouble in labour apart from an added risk of postpartum hæmorrhage. If they are in the lower segment they may appear likely to obstruct labour, but it is astonishing how most of them are drawn up past the presenting part during the first stage of labour. Delivery then proceeds normally. Fibroids situated in the cervix will not be pulled up and Cæsarean section is necessary. If the fibroid mass is very large a

Cæsarean-hysterectomy is sometimes indicated, since the fibroids may become ischæmic and infected during the puerperium.

Ovarian cysts, if above the brim of the pelvis, or if capable of being pushed out of the pelvis before or early in labour, cause no trouble. The cyst often has an elongated pedicle which may undergo torsion and for this reason it should be removed by operation fairly early in the puerperium. An ovarian cyst in the pelvic cavity and incapable of being moved must obstruct delivery. The simplest method of treatment is Cæsarean section, followed by removal of the cyst. In no circumstances should any attempts be made to pull the fœtal head forcibly past the obstructing cyst.

3. OBSTRUCTED LABOUR DUE TO ABNORMAL CONDITIONS OF THE MOTHER'S SOFT PARTS

A. *Abnormal Conditions of the Cervix*

(*a*) Rigidity of the cervix has been previously discussed with abnormal uterine action. Histological examination of this cervix reveals no excess of fibrous tissue and this is an abnormality of function.

(*b*) Cicatrization of the cervix. This may follow amputation or other operations on the cervix. Adhesions of the cervix may follow lacerations of previous labour and this is most likely to occur where there has been a prolonged interval between pregnancies. Labour may be obstructed and Cæsarean section may be necessary.

(*c*) Hypertrophy of the cervix does not usually obstruct labour.

(*d*) Carcinoma of the cervix. This should be treated immediately irrespective of the duration of pregnancy. Treatment may consist of hysterotomy or classical Cæsarean section under antibiotic cover, followed ten days later by full radium therapy. Occasionally classical Cæsarean section may be followed immediately by an extended Wertheim's hysterectomy.

B. Abnormal Conditions of the Vagina

(*a*) Cicatricial contraction due to previous lacerations or to ulceration may require Cæsarean section.

(*b*) Various abnormal conditions at the vaginal orifice. Rigid perineum, œdema of the vulva, hæmatoma from rupture of a varicose vein, adhesion of the labia and rigid hymen are the most important. They can generally be treated by an incision. In cases of hæmatoma formation the clot should be evacuated, delivery completed by forceps, and the bleeding arrested by under-sewing.

(*c*) Congenital abnormalities of the vagina including vaginal septum and vaginal diaphragm may require division under general anæsthesia before completing delivery with forceps. Afterwards the cut edge is oversewn with catgut. In many instances the septum is pushed to one side by the fœtal head and causes no obstruction.

(*d*) Utero-vaginal prolapse rarely causes any difficulty. Delivery is usually spontaneous and rapid.

C. Abnormal Conditions of the Uterus

Contraction Ring. This is a ring of localized tonic contraction that can occur in any part of the uterus. It usually occurs when the uterus has been irritated by a prolonged labour, by manipulations, or by the injudicious administration of oxytocic drugs. The ring tightly grips any narrow part of the fœtus such as the neck or the waist. The first suspicion that a contraction ring is present, is aroused during an attempt at forceps delivery performed because of second stage delay. The head can be pulled down by the forceps but returns immediately to its previous level the moment traction is released. In other cases it is only on making an intra-uterine examination in a case of delayed labour that the ring is felt. In its pathology it is exactly the same as the ring of tonic uterine contraction that causes hour-glass contraction of the uterus in the third stage. When this happens the placenta is retained in the upper part of the hour-glass.

The treatment of contraction ring during the second stage is to apply forceps to the fœtal head when the patient has been catheterized and anæsthetized. One capsule of amyl nitrite 2 ml. is then broken inside the mask and the patient allowed to inhale the vapour. In a favourable case relaxation of the ring follows rapidly and permits the fœtus to be extracted by the already applied forceps. Should no relaxation occur a further capsule of amyl nitrite is given and deep ether anæsthesia effected. In the event of failure the child is likely to be dead, in which event patience, perforation of the head and heavy forceps traction may be necessary. Should the child still be alive delivery by Cæsarean section, using a longitudinal incision to divide the contraction ring, would be permissible under antibiotic cover.

4. DISPLACEMENTS OF THE UTERUS CAUSING OBSTRUCTION

A. Pendulous Abdomen

In these cases the patient is usually a multipara with a slightly small pelvis and perhaps a bigger baby than she had in her earlier pregnancies. If the obstruction depends only on the position of the uterus, and this is unusual, it may be overcome by the application of a firm abdominal binder. If contraction of the pelvis is responsible for the obstruction, it must be dealt with by Cæsarean section.

B. Retroversion of the Full-time Gravid Uterus

This is exceedingly rare. Cæsarean section before the onset of labour is the treatment of choice. Labour results in complete obstruction, death of the fœtus and possibly also in ruptured uterus.

FŒTAL CAUSES

1. ABNORMAL POSITION OF THE FŒTUS OBSTRUCTING DELIVERY

Abnormal positions have all been discussed under the various varieties of malpresentation and malposition.

2. ABNORMAL SIZE OF THE FŒTUS OBSTRUCTING DELIVERY

Hydrocephalus

Owing to the increased size of the head, obstruction to delivery is inevitable except in very slight cases. The diagnosis is sometimes easy, the large head being recognizable by abdominal and vaginal examination, and the widely separated edges of the cranial bones plainly palpable. In other cases difficulty arises from part of the head being forced down into the pelvis and, being under tension, feeling hard enough to simulate a normal moulded head. The remainder of the head above the brim may suggest the second head of a twin pregnancy. It may require a vaginal examination under anæsthesia to make certain of the diagnosis. If the condition is suspected antenatally, an X-ray examination will reveal the abnormality. The treatment is perforation of the head when the cervix is two fingers dilated. The fluid gushes out and delivery is then usually completed naturally. If not, traction with the obstetric forceps or possibly the cranioclast should be employed. When the hydrocephalic after-coming head of a breech presentation obstructs labour, draining the cerebrospinal fluid cannot be effected until after full dilatation of the cervix. If there is an associated spina bifida, a metal cannula can be inserted into the open spinal canal. Otherwise a small transverse incision is made between the cervical vertebræ and this permits the introduction of the cannula into the spinal canal. Direct perforation of the aftercoming head is difficult and may lead to severe lacerations of the birth canal.

Meningocele

In this the meninges are protruded by fluid, and perhaps some brain material, in the frontal or occipital region. If obstruction arises, puncture the projection.

Hydrothorax, Ascites, Full Bladder, Spina Bifida

These conditions occasionally lead to obstruction after the birth of the head. Treatment: draw off the fluid with a needle and syringe.

Tumours

Congenital cystic kidneys or protrusion of enlarged viscera through congenital deficiencies of the abdominal walls, may, as extreme rarities, cause obstruction. Evisceration may be necessary to complete delivery.

Monsters

Anencephalic or acardiac monsters rarely cause any obstruction to delivery. Difficulties may be encountered if the fœtal shoulders are large and the cervix not fully dilated.

Double monsters are of four principal types:

(*a*) Two bodies united in front by the thorax or abdomen; this is the commonest variety.

(*b*) Two bodies, back to back, joined by the lower part of the spine.

(*c*) Dicephalous monsters, having two heads on a single body.

(*d*) Two separate bodies having the heads partly or wholly united.

Diagnosis should be made by antenatal X-ray. If there is a chance of fœtal survival and surgical separation then delivery is effected by classical Cæsarean section at thirty-eight weeks. If the condition is incompatible with survival, induction of labour at thirty weeks will usually be followed by spontaneous delivery.

CHAPTER TWENTY-TWO

Complications of the Puerperium

POSTPARTUM HÆMORRHAGE

Definition. This is hæmorrhage of more than 20 fl. oz. occurring after the birth of the baby and within 24 hours of delivery. In most cases the bleeding comes from the placental site after complete or partial separation of the placenta. In a few cases bleeding occurs from lacerations of the vagina, cervix or uterus.

Natural Prevention of Postpartum Hæmorrhage. During and after the third stage of labour the normally acting uterus has its constituent fibres in a state of retraction. In this thickened state they are pressed so closely together that the uterine sinuses (the blood vessels supplying and draining the placental site) are squeezed. Consequently very little blood can pass to the raw area left by the detachment of the placenta.

Causation. The causes of postpartum hæmorrhage may be either atonia of the uterine muscle or mechanical factors which interfere with normal retraction. Uterine atonia is likely to occur under general anæsthesia or deep narcosis, when labour has been prolonged, when the uterus is overdistended by twins or hydramnios, in placenta prævia where the placental site is relatively thin, and in the grande multipara whose uterus is large and relatively fibrous. Mechanical hindrance to normal retraction may occur when the partially separated placenta or fragments of placenta and blood clot are retained in the uterine cavity or when the uterine wall is distorted by fibroids.

Prophylactic Treatment

A strongly contracting uterus will usually expel the placenta and the retraction which follows will prevent postpartum hæmorrhage. It is becoming common practice to give ergometrine 0·25 mg. intravenously with the birth of the baby and this is usually followed by a short third stage and minimal blood loss. Furthermore, the ergometrine produces such powerful uterine contraction that acute inversion of the uterus becomes impossible. Cord traction is thus permissible and will aid the painless delivery of the placenta. Although prophylactic ergometrine reduces the incidence of postpartum hæmorrhage it also increases the incidence of constriction ring formation and retained placenta. The necessity for manual removal is thus increased to about 3 per cent. If the conditions which predispose to postpartum hæmorrhage are present, ergometrine should always be given with the birth of the baby.

Curative Treatment

1. If the hæmorrhage takes place before the placenta has been delivered; if the patient is bleeding at all severely, and particularly if there is any suggestion of developing shock, give 0·5 mg. of ergometrine intravenously. Await uterine contraction and then apply cord traction. If this fails, set up an intravenous saline infusion, request two pints of cross-matched blood, induce general anæsthesia and proceed to manual removal. If the patient is profoundly shocked and blood is not available, rapid intravenous infusion of dextran solution (Intradex or Dextravan) will expand the blood volume, raise the blood pressure and permit general anæsthesia.

Manual removal of the placenta. The bladder is emptied, the vagina is filled with obstetric cream and the cord reclamped and divided at the vulva. The sterile gloved hand follows the cord into the uterine cavity. The attachment of the cord to the placenta is identified and then the fingers move outwards to the edge of the placenta. With the other hand supporting the uterus through the abdominal wall the placenta is sheared off. The placenta is then grasped and removed together with the membranes. The hand is then

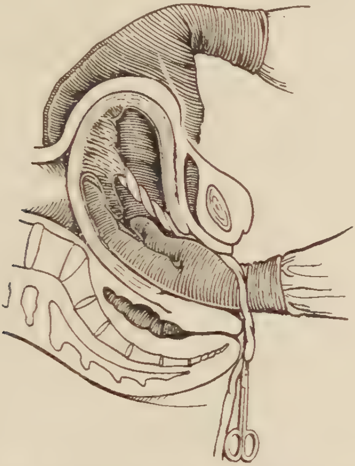

FIG. 33. Manual Separation of the Placenta.

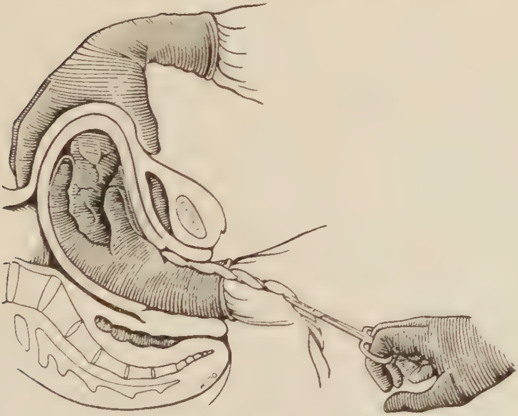

FIG. 34. Manual Removal of the Placenta.
(The forceps are held by an assistant, if one is available.)

introduced again to confirm that the uterus is empty. Antibiotics are not usually necessary.

2. Bleeding after the birth of the placenta. This is due to an atonic uterus failing to retract. Most cases respond to the intravenous injection of 0·5 mg. ergometrine. This may be supplemented by 0·5 mg. ergometrine intramuscularly and by massage of the uterus. When contraction occurs the uterus may be squeezed once to express clots from the cavity.

If the patient is under general anæsthesia bimanual compression of the uterus will control the bleeding while response to the ergometrine is awaited. The right hand is introduced into the vagina, and, when inside, folded into a half fist which rests in the anterior vaginal fornix and makes a platform against which the uterus is pressed. This is done by the left hand on the abdomen pressing inwards until it is behind the uterus, and then pulling it forwards into a position of anteversion. From this position it can be pushed down upon the vaginal hand. Bleeding from the uterus can always be arrested by this measure, but should not be attempted on the conscious patient. In spite of these measures the uterus may remain atonic and bleeding continues. A continuous intravenous infusion of oxytocin (Pitocin or Syntocinon) 10 units per pint of 6 per cent. glucose solution given at 100 drops per minute is usually effective. On very rare occasions it may be necessary to perform a hysterectomy to prevent death from postpartum hæmorrhage.

Treatment of Bleeding from Lacerations. This bleeding is recognized by direct visual inspection with the aid of good lighting and a speculum, but is suspected when a bright red trickle of blood persists, despite the uterus being empty and firm. Such bleeding is arrested by exposing the tear and suturing it with catgut. Tears in the vestibule are easily sutured under local anæsthetic, but lacerations of the cervix are more difficult to treat and require general anæsthesia and assistance.

Treatment of Hæmorrhage. The patient's head is lowered by raising the foot of the bed. Compatible blood transfusion is given as soon as possible. While waiting for this, intravenous dextran may be given, but before giving dextran, blood samples must be taken for crossmatching. Morphine gr. $\frac{1}{4}$ is given intramuscularly. Later, ferrous gluconate 2 tablets thrice daily is given by mouth to correct anæmia.

SECONDARY POSTPARTUM HÆMORRHAGE

This term is applied to cases in which bleeding takes place more than 24 hours after delivery. The bleeding may be slight or copious; there may be one or more episodes.

The cause of the bleeding is often retained products of conception—a piece of placenta, a piece of membrane, or blood clot within the uterus. Sometimes bleeding takes place as the result of localized uterine infection (see section on puerperal sepsis), and is then in the nature of secondary hæmorrhage.

Treatment. In most cases when sepsis is present the best treatment is the administration of ergometrine and systemic treatment with a suitable antibiotic. In very severe cases, even if septic, it is necessary to perform a digital evacuation of the uterus. Under anæsthesia the gloved finger is passed into the uterus, all fragments of placenta, membrane, etc., peeled off the wall, and removed with sponge forceps. Any displacement of the uterus is then corrected. An intramuscular injection of ergometrine 0·5 mg. is given, and followed by ergometrine 0·5 mg. orally twice daily for three days.

RETENTION OF THE PLACENTA

A. Hour-glass Contraction

This is due to a contraction ring of the uterus at about its middle, the placenta being retained in the uterus above the hour-glass constriction.

Treatment. The diagnosis is usually made during an attempt at manual removal. The constriction may still permit the passage of four fingers, but removal of the placenta will prove difficult. Some relaxation may be achieved by amyl nitrite vapour 2 ml. inhalation given beneath the anæsthetic mask. If this fails deep ether anæsthesia will be necessary.

B. Morbid Adhesion of the Placenta

Some placentæ are attached so firmly to the uterine wall that they cannot separate naturally (except, perhaps, in part), and indeed are only peeled off with difficulty. Such a condition is rare. If partial detachment has taken place, post-partum hæmorrhage will occur, and will be treated as already detailed. The absence of hæmorrhage will indicate that the placenta is morbidly adherent over its entire surface. A difficult piecemeal removal of the placenta is usually possible, but will be attended with risk of severe hæmorrhage and even rupture of the uterine muscle wall. If removal proves impossible and hæmorrhage cannot be controlled it may be necessary to perform a hysterectomy.

ACUTE INVERSION OF THE UTERUS

Definition. This is a partial or complete turning of the uterus inside out.

Causation. This complication can only occur in the presence of marked uterine atonia. Heavy pressure on the uterine fundus, attempts at Credé expression and traction on the umbilical cord with the placenta still attached may all precipitate the condition. Ergometrine given with the delivery of the infant ensures a firmly contracting uterus in the third stage of labour and largely prevents acute inversion.

Symptoms and Signs. Shock, manifested by pallor, faintness, weak pulse and a fall of blood pressure, develops rapidly. Hæmorrhage and bearing down pains may occur. A globular mass, often with the placenta attached, is, in the complete form, seen and felt in the vagina; in the incomplete form a round swelling is felt protruding to or through the os uteri.

On palpating the abdomen the rounded fundus uteri cannot be felt; in its place is a cup-like depression.

Diagnosis. The prolapsed œdematous cervix is sometimes mistaken for an inversion, but should easily be identified by the absence of shock and by the fundus uteri being palpable by the abdomen. The only other thing which could be mistaken for an inversion is a large polypus. Here again the fundus of the uterus is found in its proper position, and the uterine sound could be passed into the uterine cavity. In the case of an inversion it either cannot be passed at all, or can only be passed a short distance.

Treatment. Treat the shock. When this has passed off, peel away the placenta if it be still attached to the inversion, clean up the parts as thoroughly as possible, and, under anæsthesia, the reposition of the inversion may be procured by letting fluid run under pressure into the vagina while the vaginal orifice is occluded by the fingers.

RUPTURE OF THE UTERUS

Anatomy. Slight lacerations of the vaginal portions of the cervix are very common in labour, but do not usually bleed and are of little importance. A more extensive laceration spreading upwards into the lower uterine segment becomes a serious matter.

Usually, however, the more extensive ruptures of the uterus take place either through the scar of some previous operation on the uterus—as, for instance, a previous Cæsarean section—or through the lower segment of a uterus which has become greatly thinned during obstructed labour in the multigravida.

Rupture of Cæsarean section scar may take place during pregnancy without the scar being subjected to the added stress of labour, but rupture during labour is commoner. If the Cæsarean section has been of the classical type, the rupture will probably involve the placental site and there will be severe hæmorrhage. Furthermore, the fœtus is expelled through the rupture and dies of anoxia. If the Cæsarean section has been through the lower segment the rupture will not involve the placenta and there will be relatively little bleeding from the avascular scar. The fœtus is retained *in utero* and usually survives.

In rupture of the uterus following obstructed labour, the upper segment repeatedly and forcibly contracts and retracts and thus becomes short and thick. Even this powerful action is unable to push the child down and the lower segment, being passive, is stretched. The line of demarcation between the thick upper segment and the thin lower segment is the so-called Bandl's ring or the retraction ring.

Rupture through the thinned lower segment may take place spontaneously, the thinning process continuing until the wall eventually gives way; or it may be caused artificially by some misguided obstetric manœuvre.

Either rupture through a scar or rupture through the lower segment may be complete, involving both uterus and peritoneum, or incomplete, when the uterus only is ruptured, the peritoneum remaining intact. The tears are frequently more or less vertical and the edges are ragged. In size they may be quite small, but are usually big enough to let the fœtus escape partly or wholly into the peritoneal cavity.

Symptoms and Signs. If a classical scar ruptures the fœtus may slip into the peritoneal cavity through the hole so that it becomes palpable separately from the small contracted uterus. At the time of rupture there will have been some pain, and a sensation of something having given way. Subsequently, varying degrees of shock and the signs of internal hæmorrhage develop.

When a patient has been in violent labour, and her thinned uterine segment ruptures, the pain of this rupture may hardly be obvious, her previous sufferings having been so great. In fact, soon after the rupture, though signs of shock will begin to develop, the patient will feel relieved at the cessation of pain; for the uterus expels part or all of the fœtus through the rupture, is able to contract down itself, and stops its violent activity. Soon obvious deterioration appears and the patient's condition becomes clearly a grave one. Signs of shock and internal hæmorrhage (cold clammy skin, pallor, rapid feeble pulse, restlessness, air hunger and progressive fall of blood pressure) become obvious. On vaginal examination the presenting part will be felt to have receded from the os, owing to the partial or complete escape of the child through the rupture; occasionally a loop of intestine descends into the vagina through the rent. In other cases the uterus is felt to be empty and the tear palpable. It will then be possible to feel the child through the abdominal wall separately from the contracted uterus. When the rupture is incomplete, the symptoms are not so severe, and the presenting part may not recede.

Treatment. Preventive. If the patient who has had a Cæsarean section again becomes pregnant, she may be permitted a vaginal delivery if the indication for the Cæsarean section is no longer present. A good example of this situation is a placenta prævia necessitating a Cæsarean section, followed in a subsequent pregnancy by a normally situated placenta. If the indication, such as contracted pelvis, still exists then an elective Cæsarean section is performed soon after thirty-seven weeks and before the onset of labour. When vaginal delivery is permitted the second stage of labour is shortened by low forceps delivery under pudendal block.

After rupture has occurred: intravenous blood is given until the patient is fit to receive a general anæsthetic. The abdomen is then opened and the fœtus extracted through the rupture. If the rupture is small it may be rapidly repaired with a continuous catgut ligature and the uterine tubes ligated to prevent a further pregnancy. A more extensive rupture will demand subtotal hysterectomy. Blood and liquor are aspirated from the peritoneal cavity. Uterine rupture is frequently followed in the post-operative period by paralytic ileus and this is anticipated by continuous gastric aspiration and intravenous fluid and electrolytes until bowel sounds have returned. Antibiotics are given to counteract infection and iron to correct anæmia.

LACERATION OF THE VAGINAL PORTION OF THE CERVIX

Extent. Slight tears are very common, but occasionally the entire cervix is involved. The tears are generally vertical; sometimes, however, they are transverse, and in rare cases an entire ring of cervical tissue may be detached.

Causation. Lacerations occur most commonly in cases where the cervix is rigid and unyielding. They may be produced during obstetrical operations, and may result from pressure on the anterior lip of the cervix between the head and the pubes.

Consequences. Postpartum hæmorrhage and pelvic inflammation may follow tears of the cervix.

Treatment. If the rent is only slight and there is no hæmorrhage active treatment is not required. In the case of tears which are more extensive, particularly if accompanied by hæmorrhage, repair by suture is the best treatment.

LACERATIONS OF THE VAGINA

Extent. Vaginal lacerations may be mere abrasions of the surface or extensive tears. Some result in vesico-vaginal or rectovaginal fistula.

Causation. Some are caused by the forceps, especially if this instrument has been wrongly used. Other vaginal damage is the result of compression between the head and the pelvis.

Treatment. Slight tears can be left alone, but all extensive vaginal tears should be cleaned and carefully repaired by suture with catgut. The presence of hæmaturia should lead to a careful inspection to exclude vesico-vaginal fistula. This will demand expert surgical repair under general anæsthesia followed by continuous bladder drainage.

LACERATION OF THE PERINEUM

Extent. A first degree laceration of the perineum involves the mucosa of the vestibule. A second degree laceration involves the perineal body. A third degree laceration involves the sphincter ani and may extend into the anterior wall of the rectum.

Treatment. Lacerations of the perineum should always be sutured, together with the vagina. Third degree lacerations involving the anal sphincter should be sutured in hospital under general anæsthesia, preferably by a specialist. The vaginal mucosa is first sutured with a continuous catgut and this controls the bleeding. The lacerated anal and rectal mucosa is then sutured with fine catgut stitches, passed in such a way as to bring the knots within the rectal lumen. The torn ends of the anal sphincter are then identified and pulled into view. The ends are sutured with interrupted chromic catgut. The whole of the perineum is then approximated with vertical mattress silkworm or nylon sutures. The bowels are confined until five days later. Liquid paraffin by mouth and an olive oil enema ensure a soft fæcal motion when the healing is well advanced.

HÆMATOMA OF THE VAGINA AND VULVA

Hæmatoma of the vagina and vulva is an effusion of blood into the cellular tissue supporting the vulva or vagina during or immediately after labour. Occasionally more distant spread in an upward direction may take place.

Cause. The condition may be due to rupture of a vessel, sometimes an artery, but usually a varicose vein, consequent on the pressure to which it is subjected by the descent of the presenting part and the straining efforts of the mother.

Symptoms and Signs. A tense blue, highly tender swelling appears in the vagina or at the vulva, and may obstruct labour. Rupture of the swelling may take place and be followed by alarming hæmorrhage.

Treatment. If it appears during labour, under general anæsthesia incise the swelling, turn out the clot, complete delivery by forceps, stop the hæmorrhage by under-sewing the bleeding point, and repair the incision.

A small hæmatoma appearing shortly after labour may be left alone. It will be absorbed in time, unless it becomes infected, when it should be treated like any other abscess. Larger ones appearing after labour should be treated by incision and under-sewing the bleeding point.

RUPTURE OF THE PELVIC ARTICULATIONS

Rupture of the pelvic articulations is a rare sequel of delivery through a contracted pelvis. The symphysis pubis is the joint usually affected. Difficulty in walking and standing results.

Treatment. Rest in bed and the application of a plaster of Paris support.

CHAPTER TWENTY-THREE

X-Rays in Obstetrics

X-ray examination is frequently of assistance in order to reinforce the information obtained by clinical examination in difficult cases. A lateral and straight radiogram of the abdomen will reveal the exact presentation and position of the fœtus and this may be helpful in the very obese, where the abdominal muscles are tense and when the uterus is over-distended by amniotic fluid (hydramnios) and multiple pregnancy.

This method is also of assistance in the diagnosis of contracted pelvis, particularly if the patient be intolerant of internal examination. With improving technique radiologists are nowadays able to give very accurate estimates of the size of a pelvis and the relative size of a child's head. The measurements they are able to obtain of the bony pelvis—particularly the brim—are accurate to within a very small fraction of an inch. To obtain this accuracy special equipment and special experience are necessary. Even so, the most accurate knowledge of the size of a pelvis will not solve all obstetric difficulties. For the radiologist can as yet provide only relatively inaccurate information as to the size of the fœtal head. Furthermore, X-ray cannot give us any information about the power of the uterine muscle, the ease with which the cervix will dilate, the resistance of the soft tissues of the birth canal and the degree of moulding which the skull can undergo without risk of fœtal injury.

Another most useful application of radiology to obstetrics is in the diagnosis of intra-uterine death of the child. In such a case the dead fœtus is seen to be in an attitude of exaggerated flexion. Furthermore, overlapping and angulation of the cranial bones develops and this appearance is called Spalding's sign.

X-rays will also, under favourable conditions, demonstrate prenatally that a fœtus is afflicted with hydrops fœtalis. It can reveal skeletal abnormalities of the fœtus which may be suspected should hydramnios be present.

X-rays may assist with the antenatal diagnosis of placenta prævia. Lateral films are taken with the mother standing and lying supine. An increase in the distance between the fœtal head and the symphysis pubis or between the fœtal head and the sacral promontory suggests a placenta prævia. Soft tissue roentgenography and the demonstration of a very fine pattern of calcification may provide direct evidence of placental localization.

Section Three

OBSTETRIC OPERATIONS

CHAPTER TWENTY-FOUR

Induction of Labour

Induction of labour may be performed in the interest of either mother or child. Whatever method is used there is always a risk of failure, the incidence of Cæsarean section is doubled and there are slight inherent maternal and fœtal risks. Induction for convenience or social reasons is seldom justified.

Indications

Pre-eclampsia. This condition reduces placental efficiency and there is always an added fœtal risk. When term has been reached and there is little risk of fœtal death from prematurity, termination of pregnancy is indicated. Even before full maturity has been reached induction may be necessary in cases of fulminating pre-eclampsia. Where albuminuria has been present for more than two weeks or where there is a steady deterioration induction is indicated.

Essential Hypertension and Chronic Nephritis. Both these conditions carry a very high fœtal risk. Pre-eclampsia is often superimposed and premature induction or Cæsarean section is usually necessary.

Postmaturity. The rapid fœtal growth near term may result in placental insufficiency and this appears to increase with the prolongation of pregnancy. The large baby may accentuate problems of mild cephalo-pelvic disproportion and necessitate difficult forceps delivery. Many obstetricians now prefer to reduce these risks by inducing labour when ten days past term. This may be a wise policy if the inherent risks of the induction appear to be small. In the multigravida, however, there is seldom any indication for surgical induction purely on the grounds of postmaturity, since the risk of anoxic fœtal death *in utero* is slight.

Twins. The overdistension of the uterus usually results in a spontaneous premature onset of labour. When term has been reached induction is often preferred.

Previous Obstetric History. A history of a previous unexplained death *in utero*, of large babies that tend to increase in weight with each successive pregnancy, and of a previous baby affected by hæmolytic disease of the newborn are all good indications for surgical induction.

Contracted Pelvis. When contracted pelvis was discussed it was pointed out that Trial of Labour had superseded the induction of premature labour for primigravidæ. As a result of these trials, certain cases will emerge in which the mother does succeed in delivering per vaginam, but only with the assistance of a traumatic and difficult forceps operation. In these cases the trial of labour indicates moderate disproportion and subsequent children should be delivered before term. As a potential multipara, she becomes a suitable subject for induction of labour at the thirty-sixth to thirty-eighth week of her subsequent pregnancies. Even so much of the difficulty encountered during forceps delivery is due to resistance of the pelvic floor and the ease with which subsequent deliveries are conducted is surprising.

Diabetes Mellitus. The condition produces large babies. Fœtal death *in utero* or neonatal death from atelectasis are both common. It is now customary to terminate pregnancy at about thirty-six weeks. This is effected by Cæsarean section in the primigravida and by surgical induction in the multigravida who has previously had vaginal deliveries.

Hydramnios. This often results in an early onset of labour. When gross distension causes severe maternal discomfort and dyspnœa at rest, induction is indicated.

Congenital Malformation. Severe malformations incompatible with survival may best be delivered prematurely. Such cases include iniencephaly, anencephaly and hydrocephaly.

Cardiac Disease. Premature induction for maternal heart disease is seldom indicated. After the thirty-second week there is probably a progressive fall in circulating blood volume and this favours the postponement of labour until the spontaneous onset near term.

Methods of Inducing Labour

Castor Oil. The patient is given 1½ fl. oz. of castor oil by mouth; an hour later she takes a prolonged hot bath and this is followed by a copious soap and water enema. This will often promote labour at term, but the intestinal colic is unpleasant for the patient and there is some evidence that the purging may increase the risk of sepsis.

Quinine. This may occasionally provoke violent uterine contractions and for this reason should be given only when there is a death *in utero*. Quinine sulphate grains 10 is given daily for three days.

Oxytocin. This is a preparation of posterior pituitary extract (Pitocin) and more recently a synthetic equivalent (Syntocinon) has become available. Both are free from the antidiuretic-pressor factor. The sensitivity of the uterus to the oxytocic action is variable and oxytocin is most safely given in high dilution as a continuous intravenous infusion. Two units of oxytocin are diluted with one litre of sterile 6 per cent. glucose solution. The response of the uterus to 10 drops per minute is observed and the drip rate gradually increased until the uterus contracts every four minutes. The average patient requires 0·2 units of oxytocin per hour. The uterine contractions are usually painless during the first 3–4 hours of the infusion, but thereafter the usual discomfort of labour is experienced and the cervix dilates progressively. It is wise to keep the drip running throughout the second and third stage and to give intramuscular ergometrine before stopping the oxytocin after labour is completed. The oxytocin drip is of great value in cases of failed surgical induction, but is contra-indicated in the presence of fœtal distress, contracted pelvis, hydramnios, inco-ordinate uterine action and Cæsarean section scar.

Surgical Induction

This method does not require constant supervision and is preferred by most obstetricians, who reserve the oxytocin drip for surgical failures. It is now the usual practice digitally to stretch the cervix, sweep the membranes and rupture the forewaters with a toothed forceps. This is often done under pethidine narcosis, but the primigravida may require a general anæsthetic. When the fœtal head is not fixed in the pelvic brim or where there is an excess of liquor amnii a Drew Smythe catheter may be introduced through the cervix, behind the head and into the hindwaters. A measured volume of liquor may then be taken off.

The risks of surgical induction include retraction of the placental site from loss of liquor, infection of the birth canal, prolapse of the cord and an increase in the incidence of complicated labour and Cæsarean section. The introduction into the uterus of bougies, hydrostatic bags, balloons and rubber tubing were methods previously used, but all were attended by a high risk of complications, particularly sepsis.

CHAPTER TWENTY-FIVE

Trial of Labour

Trial of labour, though not strictly speaking an obstetric operation, is mentioned in this section, since it has already been referred to as an alternative to the induction of premature labour.

The reason for the tendency to adopt this treatment in preference to induction, is that it gradually became clear that many cases subjected to induction were unnecessarily induced, and would, if they had been allowed to come into spontaneous labour at term, have succeeded in delivering themselves normally. It has become the recognized obstetric practice to insist that all cases of disproportion or doubtful disproportion must be delivered in an institution where the nurses and the asepsis can be trusted and where facilities are available for the performance of lower segment Cæsarean section if required.

Trial of labour is a method of management of obstetric cases in which there appears to be a minor degree of disproportion either from a contracted pelvis, or from a large head, or both. No attempt is made to induce labour and the spontaneous onset of labour is awaited until at least ten days over term. All vaginal examinations are made using a very strict antiseptic technique. Presentation of the cord is excluded at the onset of labour and prolapse of the cord excluded when the membranes rupture. The progressive descent of the head is observed by careful abdominal palpation aided by infrequent vaginal examinations and if necessary a lateral X-ray of the pelvis. If the membranes are still intact at half dilatation of the cervix, they are ruptured artificially. If after a further 4 to 6 hours of strong labour the head has not engaged in the pelvic brim, insuperable disproportion can be diagnosed and a lower segment Cæsarean section is performed without further delay. If, on the other hand, there is progressive descent of the head with engagement in the pelvic brim, then a safe vaginal delivery can be awaited. About half the cases will require a forceps extraction and "trial of labour" should always be conducted in hospital. Unfortunately many trials of labour are terminated by Cæsarean section because fœtal distress develops before serious disproportion has been excluded. Nevertheless the first labour with an unscarred uterus is the ideal trial of labour. Once Cæsarean section has been performed there is always a threat of ruptured uterus in any future labour.

CHAPTER TWENTY-SIX

Version

Definition

By version (turning) is meant the alteration of the lie of the child *in utero* by means of some manipulation.

Varieties

(*a*) *External Version.* The manual manipulation is applied to the fœtus through the abdominal wall. In most instances an attempt is made to produce a cephalic presentation and this avoids the risks inherent in breech delivery. External version is usually performed in the antenatal clinic after the thirty-second week. Anæsthesia is seldom necessary. External version to a breech is occasionally performed before rupturing the membranes for unstable lie, but as a method of treating placenta prævia it has now been abandoned.

(*b*) *Internal Version.* This is performed through a well-dilated cervix by introducing a hand into the uterus, displacing the head and pulling down one leg. As this is being done the head moves up to the fundus, and the presentation becomes a half breech. It may be necessary to assist the ascent of the head by external manipulations.

A variation of "internal version" is the very much more difficult "bipolar version", which is necessary when the cervix admits only two or three fingers. Because of manipulative difficulties it has been largely abandoned. The fingers push up the head and then the shoulder, and finally bring down a leg, and their action is assisted by external forces applied through the abdominal wall.

The indications for version by one of the internal methods are shoulder presentation and occasional cases of prolapse of the cord. It is not performed nowadays as a method of treating placenta prævia or minor degrees of contracted pelvis; nor, except in the rarest of cases, as a method of securing rapid delivery. For this latter purpose it was in general use some years ago as part of the treatment of a case of eclampsia, but such methods have nowadays been abandoned in favour of more conservative medical treatment.

Further discussion of the place occupied by the two varieties of version by internal manipulations—i.e. bipolar version and internal version—will be found in the sections devoted to shoulder presentations and prolapse of the cord.

No attempt has been made to give a detailed description of how to perform each variety of version, since this must be learnt under instruction on the patient. Internal version is always performed under general anæsthesia. The uterus as well as the abdominal wall must be relaxed and all manipulations must be performed with skill and gentleness. If the liquor has drained away, if the uterus is in spasm and if the operator is clumsy or overzealous, there will be a grave risk of uterine rupture.

CHAPTER TWENTY-SEVEN

Forceps

Types of Instruments

1. *The Long Forceps.* The blades are attached to the handles by means of a shank. The blades have two curves: first, a cranial curve, by means of which they fit around the child's head; and, second, a pelvic curve, by means of which when inserted into the pelvis, they lie in a direction corresponding to the axis of the birth canal. It will be seen, therefore, that these blades are designed to fit and to be applied to the sides of the pelvic cavity (irrespective of the position of the fœtal head), with the convexity of the pelvic curve backwards towards the sacrum.

2. *Axis Traction Forceps.* When the forceps has to be applied to a head high up in the pelvis, it is almost impossible with the ordinary long forceps to make the line of traction backwards and downwards in the axis of the birth canal. To overcome this difficulty, various types of instrument have been invented with traction rods joined to the blades or the shanks of the forceps. By means of a handle on the traction rods, the pull applied is made to correspond in direction closely with that of the birth canal.

The extraction of a head, the advance of which has been delayed high up in the pelvis, is not a case for domiciliary midwifery. It is very much an operation for the expert with ample assistance, with a good anæsthetist and in first-class hospital surroundings. He may regard it as a "trial of forceps"; so that, should real difficulty be met, he will abandon the attempt at forceps delivery and proceed to immediate Cæsarean section.

3. *Short Forceps.* These are similar to the long forceps, but the shank has been omitted. They are used for delivery when the head is arrested, but visible on the perineum.

4. *Kielland's Forceps.* This instrument should only be used by the specialist obstetrician. There is very little pelvic curve and this permits a perfect cephalic application, irrespective of the position of the fœtal head. Malpositions can be corrected by rotating the fœtal head at any selected level within the pelvic cavity. Unlike manual rotation there is little risk of pushing the head free above the pelvic brim. In the hands of the skilled it can effect a controlled delivery free from trauma even in relatively difficult cases. The inexperienced may, however, cause serious damage to both mother and child.

Indications for Forceps Delivery

1. *Fœtal Distress.* This is revealed by meconium stained liquor; a fœtal heart rate of less than 110 per minute or more than 170 per minute; irregularity of the fœtal heart rate. Compression of the umbilical cord will cause fœtal distress.

2. *Maternal Distress.* This may be emotional or physical with a pulse rate of more than 120 per minute and evidence of dehydration and exhaustion.

3. *Maternal Disease.* This may be organic heart disease, pulmonary tuberculosis, and severe pre-eclampsia.

4. *Delay.* This may be due to a persistent deep transverse arrest or occipitoposterior position of the vertex, or a mento-posterior face presentation. Mild cephalo-pelvic disproportion, and particularly slight narrowing of the outlet may cause delay. Other causes of delay include resistance of the soft parts and poor infrequent uterine contractions and weak expulsive efforts on the part of the mother.

Difficulties and Dangers of Forceps Delivery

Difficulties sometimes arise because forceps delivery is attempted before certain conditions have been fulfilled. The cervix should be fully dilated; the membranes will be ruptured; the bladder must be emptied; the head should be fully engaged in the pelvic brim and preferably low in the pelvic cavity; there must be a suitable presentation and these include (*a*) vertex, (*b*) face—mento-anterior, (*c*) aftercoming head of a breech, (*d*) there should be a good indication for hastening delivery and a good chance of successfully delivering a live infant.

The commonest reason for failed forceps delivery is an unrecognized or uncorrected occipitoposterior position and an incompletely dilated cervix. The general practitioner is advised not to apply forceps in the patient's home unless the fœtal head is visible at the vulva and delivery can be easily effected under pudendal block. When the head is situated in the brim (high forceps application) the operation becomes difficult, and one that should be undertaken only by an expert. It is perhaps insufficiently emphasized in our teaching that the use of the forceps should be restricted to the application of this instrument when the head is through the cervix and low in the pelvis.

Forceps delivery in the primipara should always be accompanied by episiotomy. If the delivery has been difficult visual inspection of the cervix and vaginal vault is advised and all lacerations should be sutured with catgut.

Damage to the infant is usually limited to slight bruising of the face, occasional abrasions of the skin and cephalohæmatoma. Facial palsy is usually unilateral and transient. More extensive injury including intracranial hæmorrhage and fractures of the skull bones result from poor cephalic application of the forceps blades, excessive traction force and too rapid a delivery.

Preparations for Forceps Delivery

When it is intended to apply forceps the instrument table should be laid out as for a surgical operation. There should be sterile gloves, gowns, forceps, Spencer Wells forceps, scissors, needles, suture material, dissecting forceps, towels for draping the patient, a bowl of antiseptic, a bowl of obstetric cream, swabs and sterile vulval pads. The position of the patient is discussed below. The anæsthetist is a highly valuable assistant and should be present in all cases, even in domiciliary practice, whenever possible. In addition to his own instruments there should be available for his use sterile hypodermic syringes and ampoules of ergometrine 0·5 ml. and neonatal Lethidrone 1·0 mg.

Method

1. Position. In hospitals, or under conditions where adequate assistance is obtainable, the dorsal position is preferred. Better exposure is obtained, and more adequate attempts at asepsis can be made. Other obstetricians consider the lateral position is safer as it lessens the risk of aspiration of vomit during anæsthetic induction.

2. Preliminary preparation. The vulva will have been shaved and the rectum previously evacuated with an enema or Dulcolax suppository. The patient is put into lithotomy position and the buttocks brought to the edge of the bed. The bladder is emptied with a catheter. If the membranes are intact they are ruptured with a toothed forceps. Full dilatation of the cervix is confirmed. The suture lines of the skull are carefully palpated and the exact position of the fœtal head in relation to the mother's pelvis is ascertained.

Introduction of the Blades. The forceps are assembled to confirm that they are a matching pair. The left blade is selected and is introduced into the vagina along the left side of the mother's pelvis. The handle and shank are held parallel with the mother's right groin and two fingers are used to guide the blade into the vagina. When the tip of the forceps blade has passed the parietal eminence the handle is swung downwards and towards the midline until it comes to rest with the handle lying horizontal. The hands are reversed and the other blade is inserted in a similar manner. The blades can be applied directly to the fœtal head provided the occipital bone is within 45 degrees of the symphysis pubis. The sagittal suture should lie directly between the forceps blades. The handles are pushed gently against the perineum and then locked. If the handles do not come together, then suspect an unrecognized occipitoposterior position.

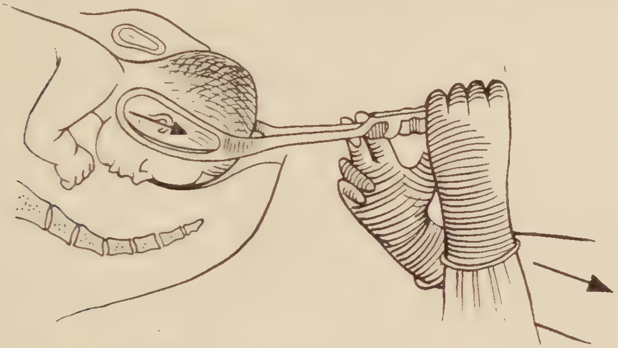

FIG. 35. Forceps Delivery. The left hand holds the handles together. Traction is made on the shank of the forceps with the fingers of the right hand. This effects traction in the axis of the birth canal.

When the blades are in position, the vaginal fingers examine to make sure that no cervix is gripped between the blades and the head, and a tentative pull is made to ascertain that the blades are not apt to slip. If they do start to slip, again suspect an occipitoposterior position. Should it be necessary to deliver a baby in the face-to-pubes position, press the blades well backwards on the fœtal head so that the grip is over the parietal eminences.

Many forceps are fitted with wing-nut locking screw. This serves only to crush the head and should never be used.

It is unnecessary to await uterine contractions before applying traction. After confirming a perfect cephalic application by a further digital examination, traction is made downwards and backwards in the axis of the birth canal. This is most easily achieved by sitting in front of the patient, grasping the handles with the left hand and applying traction on the shank with the right fingers. Each traction effort should not exceed five seconds and should be followed by a pause of equal duration. The episiotomy is delayed until the head is on the perineum. As the head descends the handles of the forceps are lifted upwards so that at the moment of crowning they are vertical. The forceps blades are removed as soon as the infant's brow has emerged and this is best achieved by swinging the handles laterally. The face is delivered by manual extension and pressure on the perineum.

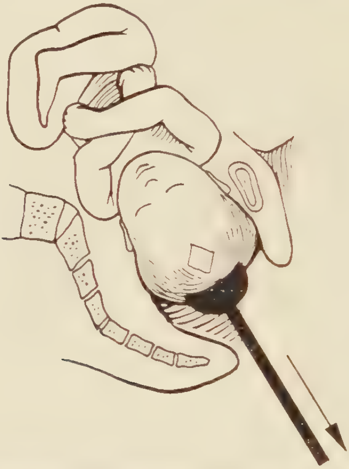

FIG. 36. Vacuum Extractor. A metal cup is applied to the scalp by suction and traction is made in the axis of the birth canal.

The Vacuum Extractor

As an alternative to the obstetric forceps there has recently been introduced into obstetric practice a metal suction cup which is attached to the fœtal scalp. Traction is made on the base of the cup in the axis of the birth canal and the head slowly delivered. Delivery can usually be effected under local analgesia. The vacuum is slowly increased up to 0·8 of an atmosphere and traction is applied intermittently. Care must be taken to exclude the cervix and vagina from the cup, the vacuum should be released every ten minutes and delivery by this method should not be attempted in the presence of fœtal distress. The cup produces a large caput and the incidence of cephalohæmatomata is increased. Excessive traction leads to the cup coming away from the scalp, but this should be accepted as a safety factor. The occipitoposterior position will usually rotate to the front as the head is pulled down on to the pelvic floor. Most obstetricians still prefer the obstetric forceps, but for the general practitioner performing the occasional instrumental delivery it may prove to be an attractive and safer alternative.

CHAPTER TWENTY-EIGHT

Craniotomy and Embryotomy

CRANIOTOMY

This is perforation of the child's head. It is rarely required and then only for the following indications:

1. Dead child, including the after-coming head of a breech.
2. Hydrocephalus.

In the case of hydrocephalus, perforation is usually performed when the cervix is about two fingers dilated. Under general anæsthesia the Simpson's perforator is pressed firmly against the skull until the shoulders of the instrument rest against the scalp. The blades are then opened and closed. The perforator is rotated through 90° and the operation repeated. The cerebrospinal fluid is allowed to escape and closure of the perforation prevented by a piece of pressure rubber tubing. As the skull collapses the uterine contractions push the head into the pelvis and vaginal delivery is effected at full dilatation possibly with the aid of the obstetric forceps. On rare occasions it may be necessary to apply the cephalotribe, which is a three-bladed instrument designed to crush and grasp the skull.

When the fœtus presents as a breech, the hydrocephalic after-coming head may be drained by a metal cannula inserted into the spinal canal.

EMBRYOTOMY

Decapitation

This operation is required for the very rare cases of shoulder presentations which have become impacted, and in which the fœtus is dead. Version is contra-indicated because any attempt to turn the fixed fœtus in the presence of the thinned-out lower uterine segment would undoubtedly rupture the uterus. It should be realized that decapitation is required only when there has been gross obstetric neglect of a case of shoulder presentation. The vast majority of these cases can be dealt with by version.

Evisceration

Evisceration is almost never required. The exception may be a case of hydrops fœtalis, when the abdomen, and if necessary the chest, is perforated with a large blunt-pointed pair of scissors.

Cleidotomy

This operation consists in dividing the clavicles, with strong blunt-pointed scissors. The pectoral girdle is much reduced, and thus the operation is occasionally of use in the extraction of very large shoulders when episiotomy and heavy traction on the head have failed to effect delivery.

CHAPTER TWENTY-NINE

Cæsarean Section

Definition

This operation involves the removal of the child through an incision made in the uterine wall. In the classical Cæsarean section the incision used to be made in the middle part of the anterior uterine wall, while in the modern operation, the lower segment Cæsarean section, the uterine incision runs transversely across the lower segment—i.e. within an inch or two of the cervix.

Indications

The classical operation has been almost entirely superseded by the low segment operation. The indications now to be discussed will therefore refer only to the modern operation. It will be appreciated that the indications for Cæsarean section have widened greatly in recent years, particularly in view of the more effective methods of treating infection with antibiotics, the more liberal use of blood transfusion, and modern methods of anæsthesia.

Disproportion. When the true conjugate is less than 3½ inches safe vaginal delivery near term is seldom possible and Cæsarean section before the onset of labour is preferred. A failed trial of labour, a failed attempt at forceps delivery for outlet pelvic contraction and moderate pelvic contraction with a breech presentation are all good indications for Cæsarean section.

Malpresentation. A brow and face presentation should be permitted a short labour, but if the head remains above the brim, vaginal delivery is contra-indicated. Delay of more than one hour in the second stage of labour with a breech presentation usually indicates insuperable difficulties and Cæsarean section should be seriously considered.

Placenta Prævia. Lateral placenta prævia may be treated by artificial rupture of the membranes, but all other cases are best delivered by Cæsarean section performed near term, when the fœtus has a reasonable chance of survival.

Prolonged Labour. When labour has been prolonged for more than 36 hours and the cervix is less than three fingers dilated, Cæsarean section is often performed and this will increase the chances of fœtal survival. A complete failure to induce labour by surgical or medical methods often necessitates Cæsarean section.

Pre-eclampsia. When this occurs early in pregnancy it may be necessary to deliver the fœtus at about thirty-two weeks. Surgical induction is seldom successful at this early stage and Cæsarean section is preferred.

Diabetes Mellitus. If labour is prolonged for more than twelve hours, ketosis is likely to develop and the fœtus may die *in utero*. In the primipara, Cæsarean section insures a rapid delivery with the diabetes fully controlled.

Tumours. Carcinoma of the cervix, rectum and bladder, and ovarian cysts and fibroids which remain below the presenting part in labour are all indications for Cæsarean section.

Ruptured Uterus. The fœtus is usually removed at laparotomy. The rent is either repaired and the uterine tubes ligated or a subtotal hysterectomy is performed.

Fœtal Distress. If immediate delivery is indicated and the cervix is less than three-quarters dilated, then rapid Cæsarean section may rescue the infant.

Other rare indications include previous vesico-vaginal fistula, or third degree tear; surgical cure of stress incontinence; acute appendicitis or other perforated viscus; Siamese twins; iniencephaly.

Prognosis

When the lower segment operation is performed at a selected time, and under good conditions, there still remains an operation risk for the mother of about 0·5 per cent. This fact is often overlooked, with the result that Cæsarean section is recommended for relatively trivial reasons which do not justify a major operation. For the child the prognosis is good, the stillbirth rate and neonatal death rate being about the same as for normal labour and much better than for abnormal labour. With regard to the mother, the danger increases in proportion to the length of labour and the risks of sepsis having been introduced by the vagina.

The Lower Segment Operation

The abdominal incision is between the umbilicus and the pubes. When the abdomen is open a transverse incision is made in the peritoneum covering the lower uterine segment and the peritoneal flaps are pushed upwards and, particularly, downwards so as to expose the muscle of the uterus and to move the bladder and ureters out of danger. Packs are inserted on both sides of the uterus to reduce the spill of blood and liquor amnii into the peritoneal cavity. A small transverse incision is made in the muscle of the lower segment until the amnion is seen. This is then incised, the suction apparatus started and the incision in the lower segment extended laterally by tearing with the fingers until the resistance of the lateral uterine walls and the uterine vessels can be felt. The opening in the uterus will then be large enough to permit delivery of the fœtus. At this point it is helpful if the anæsthetist will give 0·5 mg. ergometrine intravenously. The fœtal head is most easily delivered by digitally hooking out the jaw, inserting the hand below the head and then flexing the head by pressure on the occiput. This mimics the mechanism of labour in a spontaneous face delivery. If the head is impacted in the pelvic brim a steep Trendelenburg tip will assist delivery. The placenta and membranes are delivered and the uterine cavity explored with the hand to exclude retained placental fragments. The uterine incision is then closed with interrupted and continuous catgut. When hæmostasis has been achieved the peritoneal flaps are reunited. The abdominal wall is closed in layers.

Operations which Aim at Widening the Pelvis

Pubiotomy is an operation which is attended by a high risk of osteomyelitis and has now been abandoned. Symphysiotomy consists of division of the symphysis pubis which permits lateral rotation of the innominate bones and a permanent enlargement of the pelvis. In underdeveloped countries there is always a risk that the patient with a Cæsarean section scar will fail to return for medical care during any future pregnancy. If the Cæsarean section had been done for disproportion there will be a grave risk of scar rupture during subsequent obstructed labour. Under such conditions symphysiotomy is an attractive alternative to Cæsarean section with sterilization. In Great Britain there is probably no place for symphysiotomy.

CHAPTER THIRTY

Anæsthesia in Labour

During the first stage of labour general anæsthesia should be avoided. The inhalation of gas and air by means of a Minnitt's or similar apparatus may be given towards the end of the first and during the second stage. Good relief from pain can be effected during the first stage of labour by giving chloral hydrate grains 60 per rectum and pethidine hydrochloride 150 mg. by intramuscular injection. The pethidine should be repeated after two to three hours since it is a short-acting drug and the analgesic effects have usually passed off within four hours. In cases of inco-ordinate uterine action the more prolonged action of morphine or Omnopon may be employed. These drugs are transmitted across the placenta from the maternal to the fœtal circulation and cause depression to the fœtal respiratory centre. This may result in serious asphyxia neonatorum. This respiratory depression may be counteracted by an injection into the umbilical vein of nalorphine hydrobromide (Lethidrone Neonatal) 0·5 mg. or levallorphan tartrate (Lorfan) 0·25 mg. Some obstetricians prefer to give the mother Lethidrone 10 mg. by intravenous injection about ten minutes before delivery.

In attempts to find the perfect analgesic for the first stage of labour many different drugs—morphine, Omnopon, paraldehyde, various of the barbiturates and, particularly in recent years, pethidine, have been tried. Larger textbooks than this must be consulted for details of such treatments.

It is sufficient here to indicate that, in addition to the adverse effect on the fœtus, most of these analgesics suffer from the disadvantage that their effect varies greatly in different patients. We are as yet far from finding the ideal though many seem to consider that pethidine approaches more nearly to this than does any other drug.

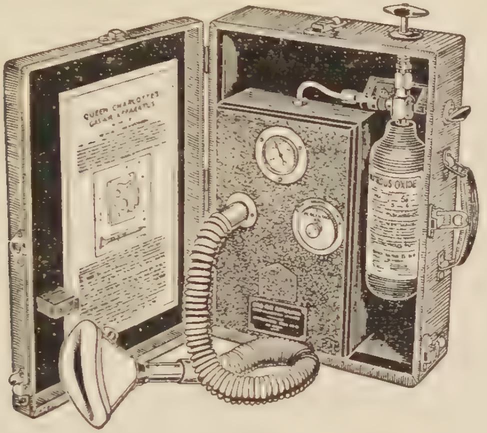
QUEEN CHARLOTTE'S GAS AIR APPARATUS
NITROUS OXIDE

FIG. 37. Portable Gas and Air Apparatus.

In the second stage of labour Trilene vapour 0·5 per cent. from an approved inhaler, or nitrous oxide and air 50 per cent. mixture are given by the midwife. The doctor may obtain better analgesia with intermittent nitrous oxide 80 per cent. and oxygen 20 per cent. mixture, but this can of course produce complete anæsthesia. Cyclopropane, nitrous oxide and oxygen may be given for crowning of the head when an anæsthetist is in attendance.

The anæsthetic for Cæsarean section is often atropine grains 1/100 for premedication; thiopentone (Pentothal) 0·5 grammes for induction; nitrous oxide, oxygen and cyclopropane to maintain anæsthesia, repeated intravenous Scoline for relaxation, and a cuffed Magill's intratracheal tube to maintain a clear airway and prevent inhalation of vomit. This type of anæsthetic is pleasant for the patient and does not depress the fœtal respiration, but it should be administered only by a fully-trained skilled anæsthetist. In many clinics spinal anæsthesia or high extradural anæsthesia are employed for this operation, but many obstetricians fear the fall in blood pressure which is apt to occur.

Pudendal Block

It is regretted that the complications of general anæsthesia, including the inhalation of vomit with bronchial spasm and obstruction, acute overdosage with cardiac arrest and deficient oxygenation with cerebral damage, are still responsible for many maternal deaths. During recent years local anæsthesia has become increasingly popular for many of the assisted vaginal deliveries. The vulva is infiltrated with 0·5 per cent. lignocaine hydrochloride (Duncaine) 30 ml. A further 10 ml. is injected around each pudendal nerve as it passes around the ischial spine. This is made possible by inserting a needle backwards and downwards for a distance of 4 inches through the paravaginal tissue with two fingers in the vagina acting as a guide. This infiltration blocks the pudendal nerve, and the perineal branches of the ilio-inguinal and posterior cutaneous nerves of the thigh. The vulva and vagina are rendered anæsthetic and the perineal muscles and pelvic floor are relaxed.

When a difficult forceps delivery is anticipated, or complications arise, general anæsthesia is induced.

CHAPTER THIRTY-ONE

Puerperal Fever

Under this heading are included the various pyrexial conditions which complicate the puerperium, and of which the classification is given below. Puerperal fever is defined as any pyrexia of 38°C (100·4°F) occurring on one or more occasions during the first fourteen days after childbirth.

Predisposing Causes

After childbirth there is always one open wound, the placental site. The addition of other open wounds, such as lacerations, will naturally increase the liability to infection, and must be included as predisposing causes. Furthermore, certain women are not in a condition to withstand an attack by pathogenic bacteria and are therefore specially liable to infection. Such patients include those with anæmia, hæmorrhage (ante- or post-partum) general ill health, pre-eclampsia, nephritis, diabetes mellitus and parasitic infections.

Exciting Causes

The direct cause of puerperal sepsis is the introduction of organisms. The amount of the infection introduced depends to a great extent on the quality of the care with which the case has been conducted. If examinations, manipulations, or instrumental delivery have been performed without due aseptic and antiseptic precautions, obviously the liability to the introduction of large numbers of germs will be greater than if the case were managed in a careful manner. Among other factors which play a part in the introduction of sepsis, perhaps the most important is the dissemination of germs from the throats and noses of the attendants, by contamination of the hands and by "droplet infection" sprayed into the genital tract by talking, coughing, etc. To obviate this, it is the modern practice that all in attendance on a patient in labour should wear masks at any and every time that the vulva is exposed. In other instances virulent micro-organisms are present in the vagina before the onset of labour. The trauma of childbirth allow these bacteria to multiply and to cause a clinical infection. The virulence of bacteria varies and even before the introduction of sulphonamides it was noted that the virulence of the hæmolytic streptococcus was on the decline.

Infecting Organisms

These include:

1. The streptococcus: hæmolytic, non-hæmolytic, aerobic or anaerobic.
2. *Staphylococcus aureus.*
3. *Escherichia coli.*
4. *Clostridium perfringens* (*welchii*).
5. Occasionally other organisms.
6. The gonococcus does not cause puerperal sepsis, and although certain saprophytic organisms live on dead tissue, and may be found in the vagina, they do not cause a generalized infection.

Clinical Classification

Puerperal pyrexia may be due to birth canal infection, acute mastitis, infection of the urinary tract, thrombophlebitis and other general systemic infections, which are unrelated to childbirth, e.g. pneumonia.

Investigation. A culture from the upper part of the vagina must be taken, and in severe cases a blood culture also. A catheter specimen of the urine must be investigated bacteriologically. The abdomen is palpated for signs of general peritonitis, and the vagina and rectum must be examined for evidence of pelvic-inflammatory masses. Finally, the breasts are inspected to see if there is any sign of infection there.

Genital Tract Infection

This may be local wound sepsis of the perineum, vagina and uterus. Further spread may cause a blood-stream infection (septicæmia) or involvement of the peritoneum (peritonitis). Spread of the infection within the pelvis may involve uterine tubes, ovaries, pelvic cellular tissue, pelvic peritoneum or pelvic veins.

Symptoms and Signs. A rise of temperature in the puerperium, sometimes as early as the first day, but usually on the second or third, is the first indication of infection. Even in cases of local infection one rigor may occasionally occur early, but repeated rigors suggest that the infection has travelled to the blood stream. The lochia are occasionally suppressed; more often they are purulent and frequently offensive. The patient feels ill, but the severity of the disease can be judged only after bacteriological investigations. To do this, a speculum is passed and a culture taken from high up in the vagina. According to the type of organism that is growing, the severity of the disease can be foretold. If a hæmolytic streptococcus be found, then the case is potentially serious; but if a less virulent organism be present, then the woman will almost certainly succeed in localizing the infection, and a rapid recovery can be anticipated. If the temperature is high, if the pulse rate is 110 or more per minute or if repeated rigors occur, then the case is a severe one and septicæmia is suspected. It can be proved, however, only by finding a positive blood culture.

Spread to the general peritoneum is of very great seriousness, and is indicated by distension and tenderness of the abdomen, and perhaps an attack of diarrhœa. The early diagnosis of this condition is difficult but should be made before the classical signs of general peritonitis have made their appearance.

Spread to the local pelvic structures is indicated by pain and a persistent or increasing temperature, plus the development of a mass in the pelvis.

Spread to the uterine tubes tends to occur earlier than spread to the pelvic cellular tissue, but the distinction between these conditions is rather invidious, since the two are usually combined to some extent and the treatment of both conditions is the same.

Spread to the pelvic veins is difficult to diagnose. Spread to the leg veins is common and the usual clinical varieties have been previously discussed.

The clinical picture of birth canal infection has been dramatically changed during recent years by the introduction of potent antibiotics, which are now often given with the onset of pyrexia. The infection in consequence remains localized and quickly resolves. The pelvic organs are not damaged and fertility is thus not impaired.

Treatment. All cases of puerperal fever must be treated as infectious, and therefore notified to the Medical Officer of Health and isolated. Whenever possible they should be dealt with in isolation units specially maintained for the treatment of this disease.

The patients should be nursed in a warm, well-ventilated room and as nourishing a diet as can be assimilated should be given.

It is now common to start treating these patients with penicillin as soon as the specimens for bacteriological investigation have been collected. Penicillin should be given in large doses, 500,000 units of crystalline penicillin four times daily. Larger doses still may be given in really severe cases and particularly for cases of *Cl. perfringens* causing gas gangrene infection. This is the one type of puerperal sepsis in which an antiserum—anti-gas gangrene serum—is probably a useful addition. When the responsible micro-organism has been cultured and its sensitivity to the various antibiotics ascertained it may be necessary to stop the penicillin and give the appropriate antibiotics. Many obstetricians prefer to withhold therapy entirely until these antibiotic sensitivities are available.

Intra-uterine glycerin, which was used to localize the infection to the uterine cavity, has now been abandoned.

When the infection is long-standing, anæmia will develop and this is corrected by repeated transfusion of packed red blood cells of fresh crossmatched blood.

Not infrequently uterine infection is associated with retained fragments of placenta. When the infection has been brought under control with antibiotics, a gentle digital evacuation under general anæsthesia will hasten recovery. Early evacuation may be necessary if there is an excessive blood loss.

When the infection has not fully responded to antibiotics, a residual pelvic abscess may persist and this may require surgical drainage through the abdominal wall, the posterior vaginal fornix or the rectum, depending upon its locality.

Acute Mastitis

This is evidenced by redness, hardness, tenderness and swelling of the affected breast. It is not of early onset and there is little chance of it being mistaken for genital tract sepsis which usually manifests itself by the third day of the puerperium. Mastitis usually responds to systemic tetracycline 250 mg. four times daily combined with suppression of lactation and expression of the milk. Should abscess formation occur this will be shown by the appearance of softening in the red area, and should be dealt with by aspiration of the pus through a wide bore needle, or it should be incised and drained.

Infection of the Urinary Tract

This may take the form of a classical pyelitis and cystitis, with tenderness in the loin, frequency of micturition, pyuria, etc.; but in other cases there is merely a rise of temperature without any localizing signs and the diagnosis is made only by finding pus and great numbers of *E. coli* in a catheter specimen.

Thrombophlebitis

This has been previously discussed (see p. 84).

CHAPTER THIRTY-TWO

Psychiatry in Childbearing

Childbearing is a nodal point in the life of any woman. It faces her with a complete change in her way of life, she experiences profound changes in her body, anticipates what she has grown up to regard as a painful and dangerous situation in labour, and is rendered relatively helpless and at the mercy of her environment. These stresses affect women of every culture, but in our own society, where women bear increased economic and other responsibilities, the loss of their capacity to earn money and the fact that being a mother does not carry a particularly high status in society can give rise to special contradictions. These contradictions can lead to various symptoms in early pregnancy such as anxiety, sleeplessness, agitation, depression and acute denial of the wish to bear a child. These symptoms remain acute during the first trimester and they should be sympathetically dealt with. A few hours of patient listening, plus a judicious use of the social services, at this stage can prevent acute disturbance in later pregnancy or the puerperium. Symptoms of anxiety and sleeplessness should be controlled.

BREAKDOWNS IN PREGNANCY

There are two main classes into which mental illness in pregnancy can be divided:

1. Exacerbation of previous mental illness.

2. Anxiety symptoms which occur for the first time in pregnancy.

Exacerbation of Previous Mental Illness

The diagnosis of mental illness matters less than the elucidation of its causes, and the prognosis of mental illness depends on the way in which the patient is handled. Patients who have been previously mentally ill will already have received some sort of diagnosis and prognosis, but women who are pregnant are more easily suggestible and passive than at other times, so that optimistic suggestion and support play a large part in treatment. The labels or diagnoses already applied are likely to be:

(*a*) *Anxiety States*. These may improve or worsen in pregnancy. The patient is likely to have received psychotherapy. If this has caused her to regard herself as a childish, dependent, parent-fixated individual, and her husband as sharing or complementing these characteristics, it is extremely important to build up her self-confidence and to recall the love and support of her parents, rather than her subservience and antagonism to them, because she and her husband must themselves become able to take responsibility for the life of another helpless human being and to give this child the affection, care and support he will need. Individual reassurance and classes in mothercraft can help to foster self-confidence and build up the necessary knowledge on which this can rest.

(*b*) *Psychosomatic Syndromes*. Pregnancy can reactivate previous minor psychosomatic symptoms such as asthma, digestive upsets, various aches and pains and, of course, vomiting. Epilepsy, petit mal and migraine may either clear up completely or appear only in pregnancy.

(*c*) *Hysterical Symptoms*. These are always based on an original organic episode and may have an organic basis. This can be missed because the patient is so obviously upset, anxious and depressed. They are more likely to occur in a pregnancy in which a patient is facing other stresses such as marital disharmony, unhappy housing conditions, or extreme anxiety about illness in a near relative or economic insecurity. Dealing with these problems through the social services is extremely helpful. Sometimes, however, hysterical symptoms are an expression of sexual or other guilt which the patient finds hard to resolve. A psychiatrist may be needed to elicit and help with this, but a great deal can be done by the obstetrical attendant prepared to give the time and learn the technique of constructive uncensorious listening.

(*d*) *Obsessional Illness.* Pregnancy may occur in a patient with obsessional illness, and both pregnancy and labour can initiate patterns of obsessional behaviour or obsessional thinking in a vulnerable woman. It is difficult to differentiate in normal individuals between extreme conscientiousness and obsessional behaviour, in fact it has been said that good scientists or good nurses should be slightly obsessional in order to do justice to their jobs. Obsessional illness, when severe, is extremely frustrating and exhausting—the patient finds that washing again and again, checking the light switches, rehearsing the incidents of labour, or the frequent repetition of any thought or action prevents creative activity and repels friends. Seconal is helpful. The doctor is wise to listen, but not to encourage a recitation of the obsession. Obsessions fade when the psychiatrist has elicited the incidents in the patient's past which established the pattern, and taught the patient to understand the present stresses evoking the symptom. A patient who has been frightened by previous neglect or misunderstanding in labour and has become obsessional may be extremely ill and tense in pregnancy, but yet may recover completely after a well-conducted second labour.

(*e*) *Schizophrenia.* As in other medical conditions, pregnancy may give rise to improvement or deterioration in the patient. A patient may give a previous history, or merely describe auditory or visual hallucinations, feelings of unreality, ideas of reference—(that other people are trying to harm her), apathy, withdrawal and personal neglect. Though bad chronic schizophrenia and acute schizophrenic attacks are better treated in a mental hospital, the degree of acute mental disturbance in an otherwise charming woman which husbands and children will tolerate may often be surprising. Chlorpromazine is the drug of choice in the treatment of schizophrenia. Most mentally ill people are tired and sleepless, need night sedation and rest. If the patient needs more than 50 mg. thrice daily of chlorpromazine to control her symptoms, she will become too apathetic to live in her home and should be admitted to hospital.

(*f*) *Depressive Illness*. This may either have already assumed a recurrent pattern, the so-called endogenous depression, or it may be purely reactive to childbirth. In the latter case, there will be a history of obstetrical disaster in the family, sexual trauma in childhood or adolescence, much hospitalization involving enemas or pelvic examinations, or merely narrow or prurient attitudes in the patient's sexual education. Such patients will often give a history indicative of depression at menstruation, and of frigidity or other sexual difficulties. A great deal can be done by listening and in endogenous depression the patient may have already received mental hospital treatment and electric convulsion therapy. In this condition and in schizophrenia the patient should always be readmitted to a mental hospital when she or the relatives ask for this to be arranged. In both conditions suicidal risks are real, and the patient should not be alone at home.

(*g*) *Suicidal Attempts*. A woman may attempt to take her own life in early pregnancy, as an alternative to procuring abortion, when the pregnancy seems a burden too heavy to bear. Some women express suicidal thoughts because they are desperately afraid of the pain they are going to experience again in their next labour. However apparently superficial or unlikely to succeed an attempt at suicide may be, it should always be taken extremely seriously, particularly in pregnancy. The patient must be admitted to hospital, given appropriate medical treatment, and see a psychiatrist. Admission to a mental hospital is likely where the suicidal attempt is the result of psychotic depression, schizophrenia or hysterical psychopathy. Any suicidal attempt endangers the life of the patient, threats of suicide often precede suicidal attempts, and attempts are often repeated until successful. The most likely candidate for a successful suicide is the woman pregnant outside marriage who has isolated herself completely to hide her condition, and the woman whose psychotic reactions have isolated her from all around her. Highly skilled social work in addition to psychiatric care is needed for these patients.

(*h*) *Psychopathy.* These patients present with many symptoms, of which a long and complex unfortunate life history is one. These patients have been subjected to violence, change and neglect in childhood, and their absence of security has prevented them from ever developing stable and satisfying human relationships. These patients can be very promiscuous and difficult in pregnancy and are prone to the syndrome of "Wilful Exposure to Unwanted Pregnancy". Certain of them become pregnant again and again in spite of known rhesus antibodies, gross disproportion and other recurrent obstetrical complications. Sometimes a degree of mental subnormality is responsible. Some will repeatedly seek out abortions by legal or illegal means; others, through repeated pregnancies, are seeking out the security and affection which they know they will find at delivery, and which may make acute illness seem worth while. Psychopaths are sometimes attractive people who are interesting to talk to. They can be helped best by conceding them the affection they need, without giving them the special concessions which they have tried to gain, and which all too often have finally isolated them first from their relatives and then from their fellow patients. In the face of stress, psychopaths can become deluded or psychotically withdrawn and depressed. The present law on mental illness allows doctors and hospitals to bar their doors to psychopaths; this is, however, only a passing phase in the development of mental treatment. There is sometimes an organic basis for this condition.

Anxiety Symptoms, Confusional States in Pregnancy

It has been said that women show symptoms of anxiety and feel ill at the first sign of pre-eclampsia. This is logical since fluid retention and changes in blood pressure can give rise to malaise and present as minor mental disturbance. The woman whose fœtus has died *in utero* may also present with anxiety and confusion, and in a large series of patients a history of previous mental illness or overt anxiety in pregnancy was found to be associated with a high incidence of obstetrical abnormality. For these reasons a history of psychiatric treatment or previous breakdown should be an indication for hospital delivery.

Puerperal Mental Attitudes. The sense of anticlimax after labour, exhaustion and the tremendous shifts in electrolyte balance following labour all tend to produce emotional reactions in the puerperium. Quite severe bouts of depression, unreasonability and sleeplessness can be elicited by stresses which would normally pass unnoticed. Mild sedation, reassurance and possibly enquiry into the stresses in the social background, which includes the ward, can avoid a prolongation of this pattern. A mother should see and hold her baby as soon as possible after birth. During a long separation from the baby in prematurity gloomy phantasies of deformity arise in the mind of the mother. The sense that the child is a stranger can persist for years, seriously affecting the child's stability. Over-rigid insistence on "correct" patterns of lactation can also give rise to distress.

Puerperal Mental Illness. All the types of mental illness mentioned during the antenatal period can flare up during the puerperium. This should have been anticipated by careful history-taking in pregnancy, and the doctor should know what social situations are likely to give rise to mental upset in the patient, and what drugs are normally necessary and effective. In addition, about 1 in 1,000 women become acutely mentally ill in the puerperium, although their history and behaviour have not given rise to comment in pregnancy

This can occur at any time in the puerperium. It is more likely to occur after a difficult labour, large blood loss, sepsis, or the sudden withdrawal of large doses of hypotensive and sedative drugs used to control pre-eclampsia. The argument as to whether this is a psychiatric condition in its own right or an exacerbation of previous mental illness is debatable. The process of childbirth, its significance within a marriage and within society, its nodal and dramatic character, determine the characteristic symptoms of the patient. Women of all ages are affected, and the period of in-patient treatment required is usually twice as long as that needed by women breaking down at the same age aside from childbirth.

Symptoms. The woman is sleepless and confused, agitated and depressed. If she is deluded or hallucinated, both these manifestations centre round her child, sex and marriage. She may become acutely antagonistic to her husband and, if discharged from hospital without proper safeguards, may destroy herself or her child by violence or neglect. In acute puerperal mental illness the doctor has no alternative to placing the patient in a properly equipped mental hospital. Preferably her baby should go with her, and in any enlightened unit her relationship with her baby and her husband should be used to expedite her recovery. Lactation should be suppressed if the patient is apathetic or antagonistic to her baby, or if her state necessitates a dosage of drugs the excretion of which in the milk would harm a new-born child. This is not an absolute rule, and women who appear disorientated in other respects may tend and feed their babies devotedly under proper supervision, behaving normally only in this relationship or in relation to their husbands.

Late Puerperal Mental Illness. In the condition previously known as "lactational insanity" the woman presents with severe depression and agitation any time within a year of the birth of her child, and most commonly at three months. These patients have all been mentally disturbed during pregnancy or immediately postpartum, but have succeeded in getting their symptoms ignored by their doctor or midwife. In certain cases the patient has actually concealed her distress from her attendants because she is afraid of being parted from her new-born baby and sent to a mental hospital. The symptoms of mental illness several months after the birth of a baby are less characteristically related to child-bearing than those which appear immediately postpartum. Often the patient has been sleepless and living in a very tense situation with her family since the birth of her child (and often during her pregnancy as well); she is extremely tired and may have lost weight. This condition can be helped a great deal by psychotherapy and sedation. These patients, however, and the patients who only seek advice years after a miserable pregnancy and labour have apparently initiated patterns of mental illness, can be extremely difficult to help and can become chronically mentally ill.

It is not within the scope of this book to teach psychotherapy—the patterns suggested are not specific to the particular diagnostic headings under which they have been suggested. The intention of the author is to suggest a general attitude and approach to the chameleon-like reactions of patients, so that help can be offered to all who require it.

Drugs

The only psychiatric drugs which have been in use for long enough to appear safe to administer during pregnancy are the barbiturates, chlorpromazine and promethazine. Suspicion has been thrown on drugs containing amphetamine, meclozine and on avomine in the first three months. All psychiatric drugs affect the fœtus, and it is not known whether a reported high incidence of disorders of the central nervous system in the children of mothers who were acutely disturbed in pregnancy may be due to the drugs they were taking. Nor is there any proof that it is, in fact, safe to administer electric convulsive therapy in pregnancy.

Useful Drugs. Anxiety can be relieved by sodium amytal gr. $\frac{3}{4}$ up to three times daily or chlorpromazine 10 mg. t.d.s.

Depression can be helped by a combination of sodium amytal gr. $\frac{1}{2}$ and amphetamine gr. 5 one or two morning and afternoon. Amphetamine in any form is a drug of addiction and, though it relieves depression with or without agitation, causes sleeplessness taken after midday. Schizophrenia symptoms diminish on chlorpromazine—up to 50 mg. thrice daily and this has been reported as being safe in pregnancy. Patients on heavy barbiturate or chlorpromazine dosage may produce a sleepy baby who is reluctant to feed.

Phernergan 25 mg. twice or thrice daily is a good sedative and anti-emetic. Seconal gr. $\frac{3}{4}$ thrice daily is useful in obsessional illness.

Night sedation of up to 3 gr. sodium amytal, $1\frac{1}{2}$ gr. Seconal or 3 gr. butobarbitone may be required in addition to day sedation as above. Chlorpromazine and phenergan reinforce the effects of barbiturates on both mother and child.

APPENDIX

Adult Doses of some Drugs used in Obstetrics

Adrenaline injection, 5 minims by subcutaneous injection.
Aminophylline injection, 250 mg. by slow intravenous injection.
Amyl nitrite, 5 minims by inhalation.
Amylobarbitone sodium tablets, 3 grains.
Ancolan tablets, 25 mg.
Apomorphine hydrochloride injection, 1/45 grain by intravenous injection.
Aspirin tablets, 10 grains three times daily.
Atropine sulphate injection, 0·6 mg. or 1/100 grain.
Avertin 1 in 40 solution, 0·09 ml. per kg. body weight given per rectum.
Avomine tablets, 25 mg. twice daily.
Barbitone sodium tablets, 5 to 10 grains at night.
Butobarbitone tablets, 1½ grains at night.
Calcium gluconate tablets, 10 grains three times daily.
Castor oil, 1 to 8 fl. dr.
Chloral hydrate, 15 to 30 grains by mouth; 60 grains by rectum.
Chloramphenicol capsules, 250 mg. four times daily.
Chlorothiazide tablets, 0·5 grammes three times daily.
Chlorpromazine tablets, 25 mg. three times daily.
Codeine compound tablets, 2 three times daily.
Cortisone injection, 100 mg. twice daily.
Crystapen V. tablets, 125 to 250 mg. every four hours.
Digoxin injection, 0·25 mg. four times daily and then reduce dose.
Dindevan tablets, 150 mg. twice daily on first day and then reduce dose according to prothrombin time.

Dramamine tablets, 25 mg. twice daily.

Dulcolax tablets, 1 or 2 at night.

Ergometrine maleate injection, 0·5 mg. by intravenous or intramuscular injection.

Ergometrine maleate tablets, 0·5 mg. three times daily.

Erythromycin tablets, 250 mg. four times daily.

Ethinylœstradiol tablets, 0·1 mg. three times daily to suppress lactation.

Fentazin tablets, 2 mg. three times daily.

Ferrous gluconate tablets, 5 grains three times daily.

Ferrous sulphate compound tablets, 1 tablet three times daily.

Folic acid tablets, 10 mg. three times daily.

Gamma globulin, 1,500 mg. by intramuscular injection.

Heparin, 10,000 units intravenous injection.

Hexœstrol injection, 15 mg. daily by intramuscular injection to suppress lactation.

Hyaluronidase, 1,000 Benger units mixed with ergometrine 0·5 mg. and given by intramuscular injection.

Hydrocortisone acetate ointment, 1 or 2½ per cent.

Imferon injection, 50 to 100 mg. daily by intramuscular injection.

Insulin injection, 20, 40 or 80 units per ml.

Insulin zinc suspension, 40 or 80 units per ml.

Isoniazid tablets, 50 to 100 mg. three times daily.

Lethidrone injection, 10 mg. by intravenous injection.

Lignocaine hydrochloride, 100 ml. of ½ per cent. solution should be the maximum dose.

Linctus codeine, 4 ml.

Liquid paraffin emulsion, ½ fl. oz.

Magnesium sulphate 20 per cent. solution, 4 grammes every 4 hours by intramuscular injection for eclampsia.

Magnesium trisilicate mixture, ½ fl. oz. four times daily.

Marplan, 10 mg. three times daily.

Meclozine tablets, 25 mg. twice daily.

Megimide, 50 mg. by intravenous injection.

Menaphthone sodium bisulphite injection, 10 mg. by intramuscular injection.

Mersalyl injection, 2 ml. by intramuscular injection.

Morphine sulphate injection, ¼ grain or 16 mg. by intramuscular injection.

Mucaine, 1 teaspoonful four times daily before meals.
Nalorphine injection, 10 mg. by intravenous injection.
Nardil tablets, 15 mg. three times daily.
Nembutal capsules, 1½ to 3 grains.
Neomycin sulphate tablets, 500 mg. every 4 hours.
Neostigmine injection, 0·5 mg. by intramuscular injection.
Nikethamide injection, 2 ml. by intravenous injection.
Noradrenaline injection, 2 mg. in 250 ml. of normal saline given by intravenous drip.
Norethisterone, 10 mg. twice daily.
Oblivon capsules, 250 mg. three times daily.
Omnopon injection, ⅓ grain by intramuscular injection.
Oxytocin 2 units in 1 litre of normal saline given as an intravenous drip.
Paraldehyde injection, 10 ml. by deep intramuscular injection.
Penicillin injection, 250,000 units every 6 hours by intramuscular injection.
Pethidine hydrochloride injection, 100 to 200 mg. by intramuscular injection.
Phenergan tablets, 25 mg. three times daily.
Phenobarbitone tablets, ½ grain three times daily.
Potassium citrate mixture, ½ to 1 fl. oz. four times daily.
Primulut N. (Norethisterone), 10 mg. twice daily.
Progesterone injection, 10 mg. by intramuscular injection.
Promazine tablets, 25 mg. three times daily.
Quinalbarbitone capsules, 1½ grains.
Reserpine tablets, 0·25 to 1·0 mg. daily.
S.V.C. vaginal tablets, 2 daily.
Scopolamine injection, 1/150 grain.
Seconal sodium capsules, 1½ grains.
Senokot tablets, 2 to 4 at night.
Serpasil tablets, 0·25 to 1·0 mg. daily.
Stilbœstrol tablets, 5 mg. three times daily to suppress lactation.
Streptomycin injection, 500 mg. twice daily.
Succinylsulphathiazole tablets, 3 grammes four times daily.
Sulphadimidine tablets, 1 gramme four times daily.
Sulphamezathine, 1 gramme four times daily.
Suxamethonium chloride injection, 50 mg. by intravenous injection.

Syntocinon (Synthetic oxytocin), 2 units in 1 litre of normal saline given as intravenous drip.

Terramycin capsules, 250 mg. four times daily.

Tetracycline capsules, 250 mg. four times daily.

Thiopentone injection, 0·5 grammes by intravenous injection.

Thyroxine sodium tablets, 0·05 mg. to 0·5 mg. daily.

Urolucosil tablets, 200 mg. three times daily.

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